EUROPEAN CENTRAL BANK

EUROSYSTEM

Potential use cases for innovative technologies in securities post-trading

Advisory Group on Market Infrastructures for Securities and Collateral

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Contents

Executive Summary

Technological innovation has greatly improved the safety and efficiency of securities post-trading over the last few decades and it holds the potential to resolve open issues, as well as to address new market and regulatory needs. This prompted the Advisory Group on Market Infrastructures for Securities and Collateral (AMI-SeCo) to launch an analysis within its community of stakeholders from the European post-trade industry. In January 2018, the AMI-SeCo Harmonisation Steering Group (HSG) established a Fintech Task Force (Fintech-TF) that continued the work conducted by its former Task Force on Distributed Ledger Technology (DLT-TF) and widened its scope to other innovative technologies that could be useful in securities post-trading.

The Fintech-TF has taken into account the harmonisation and integration activities included in the agenda of the HSG to assess whether the adoption of such solutions may promote harmonisation and integration. To this end, the Fintech-TF focused on post-trade processes: (i) which are currently supported less by technology, (ii) where the technical solutions implemented are fragmented and/or (iii) which are challenged by recent or upcoming regulatory requirements.

This report contains the Fintech-TF's assessment of the feasibility and practical interest of possible use cases for technological innovation that its participants identified in the area of post-trading.

The aim of the analysis is not to recommend the use of specific technologies but to establish a common background that could be leveraged by different actors to implement system-wide solutions where needed or to develop their own applications.

A background to the analysis of use cases is provided in the first two chapters of the report. They give an overview of two different topics which are relevant across different use cases; (i) regulatory environment and (ii) governance of DLT/Fintech solutions.

Chapter 1 introduces selected recent regulatory developments and broader EU initiatives relevant for each use case that contribute to the objectives of the Capital Market Union (CMU). Regulation influences the development of financial technologies solutions to the extent that: (i) new requirements might create the case to use new technologies to improve the efficiency of the current post-trade processes and/or systems (ii) harmonisation and standardisation of certain aspects of post-trade processes would foster the implementation of new solutions.

The Fintech-TF also identified regulatory elements that can hinder adoption of the proposed use cases, some of which stem from remaining regulatory barriers already identified by the European Post-Trade Forum (EPTF)[1]. Regulatory developments warrant re-evaluation of the current procedures and practices in a number of areas. Current procedures and practices may either be

[1] EPTF is the informal expert group established by the European Commission that assessed the remaining Giovannini barriers and priorities in addressing obstacles arising from them on the way to the CMU. See the EPTF report.

inefficient, or they may not meet the requirements of the future landscape. The EPTF also took the view that developments in the Fintech / Distributed Ledger Technology (DLT) domain could have a significant impact on post trade services, related operational processes and regulatory requirements.

Two significant regulatory initiatives that may elicit the development of solutions based on new technologies are the recast of the Shareholder Rights Directive (SRD2) and the Code of Conduct on Withholding Tax (CoC). SRD2 aims at improving the process for the exercise of shareholders' rights and its efficiency, including the possibility for European issuers to have a transparent view of shareholders and therefore be able to involve them in company decision-making that includes corporate actions (CAs). The CoC aims at improving the efficiency of current withholding tax (WHT) procedures across EU Member States.

Challenges posed by emerging users' needs and regulatory requirements may warrant industry-wide responses to avoid fragmentation, including the provision of services based on new technologies that need clear governance. That is particularly the case in the DLT environments, which pose some overarching challenges (Chapter 2) as well as additional requirements that need to be addressed separately for each use case and DLT framework. Whereas governance of DLT network and applications may differ in some respects from that typical of arrangements where a single authorised operator validates transactions in a centralised database, the topics that it needs to address are largely the same as those involved in the governance of any centralised Financial Market Infrastructure (FMI), network or system. These include the allocation of responsibilities for maintenance of the network and the relevant applications, the definition of standards, change management and liability for mishaps. There are areas where the governance arrangements used for centralised systems may need innovative approaches to meet the specificities arising from the non-centralised character of the DLT network and of any distributed applications. Further analysis is warranted on the extent to which the most common DLT network governance models described in this report fit into the regulatory environment, and on what the appropriate incentives would be to reinforce the clear split of responsibilities characteristic of a DLT network.

Following the description of these background topics the following chapters present **the use cases focusing on post-trade processes that are going to be impacted by recent regulatory developments and that would benefit from prompt communication of information through the holding chain, between issuers and end beneficiaries, in both directions.** These four use cases are shareholder identification and transparency, transmission of information on corporate actions, electronic voting and withholding tax procedures.

For every use case considered, this report suggests some general objectives and proposes a high-level conceptual framework that uses new technologies to possibly achieve them. The intent of the analysis is to assess the general feasibility and practical interest of such technologies as one of the possible ways to tackle the issue at stake. The Fintech-TF has purposefully refrained from producing any detailed designs of technical solutions and cost-benefit analysis of them.

It is important to stress that the high-level solutions described to tackle each use case are by no means unique in their ability to meet the stated objectives. Issues addressed via each of the technological solutions proposed could well be solved by other means, including possibly via more traditional technologies. The report shows why a specific new technology has been favoured over a more traditional approach, but the analysis clearly covers only a small part of the requirements and constraints that would need to be considered if a choice had to be made on how to tackle the use cases in practice.

The use case on shareholder identification is motivated by SRD2 requirements on shareholder transparency. A conceptual framework is provided to use DLT to update the information on beneficiary owners of a security, or the details of who holds such information, automatically while maintaining privacy at the level of individual account relationships. The suggested approach (Chapter 3) could allow issuers to identify holders of their securities when warranted, while every market participant would continue seeing only the information related to the accounts it uses and provides. Smart contracts deployed by intermediaries at each level of the holding chain would allow their nodes to reflect, in synchronised bilateral ledgers, changes of holdings which occurred as a result of confirmed settlement instructions. This use of synchronised bilateral ledgers, a type of DLT, could avoid an issuer or its agent seeing all account relationships and settled transactions at every level of the holding chain, while all intermediaries involved in a change of holdings would vet updates at their respective levels of the holding chain to ensure that mishaps could still be identified and reconciled.

In the area of corporate actions and general meeting announcements, SRD2 requirements could be tackled by developing a 'trusted' source of information. Market stakeholders, through the custody chain, would contribute to maintaining such 'trusted' copy (Chapter 4) before the so-called 'golden' copy of information is provided by the issuer or its agent. Market participants could use DLT to exploit the visibility of tampering in a distributed ledger and develop over time the 'trusted' copy of information. The use of new technologies in the field of corporate actions was also considered useful to facilitate compliance with standards and automation of manual processes: either the definition of industry-agreed 'smart contract templates' or the use of artificial intelligence in the field of natural language processing (NLP) could make it possible to automatically translate decisions communicated by an issuer via legal documentation into formatted and machine-executable instructions.

The approach identified to improve the involvement of shareholders in the company decision-making is through electronic voting. This use case builds on top of the one on shareholder identification: once beneficiary owners (or their voting agents) are identified in the distributed ledger used for shareholder information, new technologies allow issuers to allocate the tokens required to vote to the owners or agents and let them cast their vote for their preferred option, including receiving a confirmation (Chapter 5).

To tackle inefficiencies in withholding tax procedures in the European Union, the AMI-SeCo explored areas where innovative technologies could provide answers and support the effective implementation of the best practices

identified in the CoC. Technologies that are deemed relevant for this use case (Chapter 6) include the use of Digital Identities in line with the eIDAS regulation and the use of DLT to allow the creation of an EU-wide repository of Certificates of Residence. The combination of these could pave the way to further automation in the WHT collection process. Finally, the last chapter (Chapter 7) provides TF members with conclusions and proposals for the way forward.

1 Relevant regulatory background

Recent regulatory developments are expected to impact several actors in the post-trade area. Three developments that the Fintech-TF deemed particularly relevant for post-trade services and for the use cases included in the report are the work of the European Post-Trade Forum (EPTF), which fed into the Capital Markets Union (CMU) initiative of the EC; the Shareholder Rights Directive II (SRD2) and the Code of Conduct on Withholding Tax. Significant improvements on the harmonisation challenges described in the use case for Corporate Actions Information (Chapter 4) will be delivered by the SRD2 and its implementing regulation.

As part of its FinTech Action Plan the European Commission (EC) has also taken measures to assess the existing regulation and determine whether there are any regulatory obstacles or gaps that may hinder the development of Fintech or the use of innovative technologies. This work is done by the EC "Working Group on Regulatory obstacles to financial innovation" (ROFIEG).

1.1 The European Post-Trade Forum (EPTF)

The EPTF was set up as an informal expert group to support the work of the EC in reviewing the developments in post-trading in line with the CMU. To meet this objective the EPTF published a report to list those Giovannini Barriers that have not yet been dismantled and to identify new barriers and bottlenecks in post-trade[2]. In the report, the EPTF also established priorities and time criticality in addressing the perceived obstacles on the way to a true CMU. The work of the EPTF in the context of achieving a CMU was supported by the AMI-SeCo which provided the T2S harmonisation perspective.

In its report, the EPTF highlighted the usefulness and value of FinTech and DLT as well as their potential impact on post trade services, related operational processes and regulatory requirements. Furthermore, the EPTF stressed the need to check possible, challenges of e.g. legal, technical and functional nature in particular to the post-trading sector.

1.2 Shareholder Rights Directive 2

In order for issuers, intermediaries and investors to fulfil their tasks in a stable legal and cost environment across Member States, the 2017 recast of the Shareholder Rights Directive (SRD2) and its implementing acts[3] set out common requirements in terms of content, format and deadlines relevant for the transmission of information on shareholder identification, corporate actions and the exercise of shareholders rights.

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2 EPTF report.

3 The Implementing Acts of SRD2 were adopted on 3 September 2018 and it shall apply 24 months after publication in the OJ i.e. in September 2020.

To this end, the Implementing Acts of the SRD2[4] state that "In order to facilitate and make the exercise of shareholders rights more efficient, particularly cross-border, the use of modern technologies in communication between issuers and their shareholders and by intermediaries, including other service providers which are deployed for these processes, should be encouraged".

1.2.1 Solutions provided in the recast Shareholder Rights Directive in the area of shareholder transparency

In holding chains, the SRD2 requires that information requests regarding shareholder identity must be transmitted between intermediaries without delay. The relevant information must then be shared directly by the intermediary who holds the requested information, either to the company or to a third party nominated by the company.[5] An intermediary that discloses information regarding shareholder identity according to the Directive is not considered to be in breach of any restriction on disclosure of information imposed by contract or by any legislative, regulatory or administrative provision. That substantially improves the legal certainty over the possibility for cross-border holding chains to channel the information needed by European issuers.

In addition, the recast SRD addresses the protection of shareholders' personal data. Such personal data shall be processed free from national provisions on data confidentiality. Its purpose is to enable any company to identify its existing shareholders and communicate with them directly to facilitate the exercise of shareholders' rights and their engagement. Companies and intermediaries shall not store the personal data of shareholders transmitted for the purpose of shareholder identification for longer than 12 months after they become aware that the person concerned has ceased to be a shareholder.

The implementing Act includes technical standards covering the format of information to be transmitted, the format of the request, including their security and interoperability, and the deadlines to be complied with. In the light of this standardisation of information and processing that will support further engagement in shareholder transparency by different stakeholders, the TF considered it appropriate to explore possible technical solutions dealing with the new shareholder transparency regime[6].

1.2.2 Solutions provided in the recast Shareholder Rights directive in the area of voting

The challenges faced today for a shareholder wishing to cast its vote, particularly cross-border, are caused by the manual, non-standardised process which, amongst

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4 Commission Implementing Regulation (EU) 2018/1212 of 3 September 2018.

5 Member States are allowed to introduce a threshold not exceeding 0,5% for companies having a registered office on their territory, i.e. companies may only be allowed to request the identification of shareholders holding more than the above percentage of shares or voting rights.

6 It is worth noting that SRD2 shall be transposed by Member States by 10 June 2019, with the exception of Articles 3a,3b and 3c which will have a 2-year phase implementation from the adoption date

other things, makes it difficult for shareholders to (i) receive meeting agendas and resolutions (and any update thereof) soon after they have been published, (ii) participate in the general meeting electronically and (iii) obtain confirmation that votes have been cast at the general meeting. Member States must ensure that the intermediaries are required to transmit from the company to the shareholder or to a third party nominated by the shareholder, the information (or public repository of information) which the company is required to provide to the shareholder to enable the exercise of rights flowing from its shares.

Member States shall oblige intermediaries to transmit, without delay, to the company, in accordance with the instructions received from the shareholders, the information received from the shareholders related to the exercise of the rights flowing from their shares.

All information shall be transmitted between intermediaries without delay, unless the information can be directly transmitted by the intermediary to the company or to the shareholder or to a third party nominated by the shareholder.

Member States shall ensure that the intermediaries either exercise the rights flowing from the shares, upon the explicit authorisation and instruction of the shareholder, or make the necessary arrangements for the shareholder or a third party nominated by the shareholder to be able to exercise the rights themselves.

For general meetings, companies shall provide confirmation that shareholders' votes have been recorded and counted. Where the intermediary receives such confirmation, it shall transmit it without delay to the shareholder or a third party nominated by the shareholder or to other intermediaries able to provide such confirmation to them. This applies unless the confirmation can be directly transmitted to the shareholder or a third party nominated by the shareholder.

The same Implementing Act specifies the minimum requirements to transmit this information.

1.2.3 Shareholder Rights Directive recast in the area of Corporate Actions information

The SRD2 Article 2 imposes a number of requirements on intermediaries passing on the information of corporate actions through the chain of intermediaries to the shareholders in standardised formats. The requirements on the format of announcements are not applicable to issuers and issuer agents. As there is no clear statement on the format that issuers or their agents are required to use, there is a risk that the current situation will not change significantly.

The announcements process set out in the recently adopted Implementing Act is based on the principle established in the SRD that all intermediaries must pass on down the chain of custody to the end investor a notification that contains all relevant operational information about a corporate action or a general meeting. The newly adopted rules must complement the existing market standards for corporate actions

issued by the Corporate Actions Joint Working Group, being one stepping stone where the EU addresses the EPTF Barrier 1 on Fragmented corporate actions and general meeting processes.

1.3 Code of Conduct on Withholding Tax

Work done on the field of tax processing as of 2016 includes contributions by the EPTF, European Commission (EC) and the EU Member States. The EPTF identified inefficient withholding tax collection procedures as one of the barriers[7] to efficient cross-border investment and securities, and identified the EC and all Member States as parties responsible for taking action and initiating change. The EPTF also found additional pain points such as the absence of a level playing field between local and non-domestic players, demonstrated by mandatory use of local tax advisory firms and national rules that reserve tax withholding responsibilities for local intermediaries, leading to inefficiencies (particularly in the case of cross-border investments). The EPTF report stresses the importance of harmonisation of tax collection and relief procedures together with the need for more standardisation and for higher levels of electronic processing.

As one of the CMU actions, the EC has adopted a WHT Code of Conduct (CoC), which is a non-binding document calling for voluntary commitment by the Member States. The CoC is a proportionate and balanced tool to promote convergence around a set of principles for a simpler system of withholding tax. The code provides a set of pragmatic approaches to improve the efficiency of current WHT procedures, in particular for refunds but also including procedures for relief at source.

As some of its key objectives, the CoC aims to promote the following principles:

- entitlement to submit refund claims or apply for relief;
- efficient and user-friendly digital WHT procedures and internal IT Systems;
- effective relief and provision of refunds in a short period;
- user-friendly forms and documentation requirements;
- setting up a single point of contact;
- relief at source.

The voluntary nature of the CoC to address the inefficiencies identified by the EPTF depends on the commitment by EU Member States. As provided for in the CoC, the EC is currently monitoring effective implementation of the Code through meetings with Member States. Member States are encouraged to collect and share information about progress achieved and possible obstacles encountered. While no major legal impediments have been identified so far, the challenges identified by Member States seem mostly to be on the IT and administrative sides e.g. lack of digital WTH tax

[7] EPTF Barrier 12 and Former Giovannini Barrier 11 (see the EPTF report).

procedures (such as no option to fill in a claim online); some Member States have different IT systems which require adaptations; a few Member States have significant backlogs in processing claims although most Member States can handle claims within 6 months. The CoC is planning a further review after 2019 or future action taking into account any significant changes.

Harmonisation is one dimension that is missing from the CoC. In its letter to the EC[8], AMI-SeCo stressed the importance of harmonisation of WHT procedures across the EU Member States on areas such as identification of taxpayers, the process of certification of residence and following-up on proposals set for consistent application by tax authorities of the record date principle already set out by the AG in 2016[9]. This could be done at industry level and by engaging the tax authorities in further discussions at an appropriate stage.

1.4 FinTech Action Plan of the European Commission

As part of a European Commission objective to explore how the financial sector can benefit from developments in Financial Technologies, the EC published its FinTech Action plan in March 2018. As part of follow-up work on the FinTech Action plan relevant to the post-trade sphere, the EC set up a group of experts on “Regulatory obstacles to financial innovation” (ROFIEG), which commenced its work in the summer of 2018. ROFIEG will assist the EC by providing high-level expertise on EU financial services legislation in relation to financial technology including post-trade. The mandate of the ROFIEG is to identify whether there are obstacles or gaps in the current regulatory framework that should be looked at, as they could be impediments to effective take-up of financial innovation. This work done at the level of the EC is crucial to identify and eventually to dismantle possible barriers for adopting usage and utilisation of innovative technologies in the field of post-trade. ROFIEG expects to finalise its report by June 2019.

8 *Harmonisation of withholding tax procedures* –letter from AMI-SeCo Chair to directors of DG-TAXUD and DG-FISMA, dated 18 June, 2018.

9 Discussion Note on Harmonisation of tax processing, 2016.

2 Governance of DLT environments

2.1 Introduction

Proper governance of any market infrastructure is important to ensure its safety and efficiency. Any post-trade arrangement can only work on the basis of pre-established principles and procedures aiming at ensuring its smooth functioning as user requirements, participation, and external threats and opportunities evolve.

In the early stages of the discussion around DLT solutions (e.g. Bitcoin) the impression exists that in DLT networks, thanks to their distributed nature, there is no (or only a minimal) need for a governance structure, and the network would be self-managed. Actually this “decentralised model” is not exempt from issues related to the management of the interactions among nodes participating in the network and a well-defined governance structure to manage and control aspects such as access requirements, risk management, processing rules, compliance with regulatory requirements, investor protection etc.

The potential application of DLT to particular use cases in the post-trade area requires the adoption of appropriate governance models to ensure that responsibilities regarding data handling are clearly allocated to different parties involved in the functioning of a DLT network. Further, since implementation of the DLT solution comes with interdependencies between technology and business development, this might transform the interaction between the incumbent market infrastructure and intermediaries.

Post-trade services are provided by and via a network of trusted parties whose governance frameworks derive from financial regulation requirements (i.e. mainly organisational requirements and conduct of business rules) as well as formalised agreements between participants. Within these systems, participating entities are regulated and supervised. Since any DLT application relies on the proper functioning of the technology and protocol to ensure its correct functioning, with no room for a single entity to intervene in case of issues, a governance model for DLT applications would need to reach more deeply into the use and management of technology by participants in the system.

The question of how DLT solutions shall be governed may need to be considered as a matter of platform governance (which refers to the DLT hardware and software development), application governance (including organisational aspects of a DLT network in relation to any specific use cases), and governance of intellectual property (IP) rights associated with the design of the solution used to provide a service through the platform and with the data recorded/shared through it.

The governance model would need to ensure clear change management and would have to establish mechanisms for:

- standardising procedures for established products deployed as certified code libraries;
- implementing standardised monitoring, reporting, and fraud prevention mechanisms;
- establishing rules to approve/reject authorised nodes;
- identifying if a correction is required and, if so, intervene;
- enforcing agreed standards;
- managing conflict or disputes on a cross-border basis;
- establishing liability and accountability of the nodes.

In addition to the elements listed above, it is also necessary to envisage some controls to monitor, and in some cases to certify, the quality of the programming underlying the structure of the DLT and of any automated logic applied to the information recorded in the DLT. This is also to be associated with the concept of responsibility and liability for what happens inside the code. In a "distributed" governance environment, there are key questions such as "who must be held responsible in the case of failure or problems?", that might be answered differently depending on the different Distributed Ledger platforms under consideration.

In the case of a restricted[10] DLT network, the contractual membership arrangements among the participants will probably include clauses to cover these aspects, while for an unrestricted DLT model it would be important to identify mechanisms to ensure if and how the underlying code can be verifiable by participants (though this task may in fact be rather impracticable, due to lack of adequate skills).

The software should be continuously tested, improved and updated in order to minimise risks. Even if the system structure and code take care of 99.9% of governance and are considered error-free, the evolution of technology and the changing context require that any other risks should be covered through contracts or an organisation that can handle the residual 0.1%. In order to cover this residual risk it is crucial to ensure proper governance.

However, the governance model and its details would depend on the concrete application of the DLT. Next to describing different forms of governance of a DLT network, the implementation of specific use cases cannot be underestimated. Defining a target operating model, viability (expected return), feasibility (ability to deliver) and desirability (alignment with business) should be considered.

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[10] Instead of referring to "permissioned" and "permissionless" nature of DLT networks, the terms "restricted" and "unrestricted" have been preferred to avoid confusion among inconsistent DLT jargon, consistently with the glossary included in the AMI-SeCo publication "The potential impact of DLTs on securities post-trading harmonisation and on the wider EU financial market integration". According to definition, a DLT network can be considered: "restricted", when "it can be accessed only by a specified set of participants, who can then be assigned different roles (in this specific case, the colloquial term "permissioned network" is often used)", and "unrestricted", when there is no restriction on participation and any entity has the possibility to become a participant without having to link its identity to its network address or public key in the network".

2.2 Approaches to governance models for establishment of a DLT network

Looking at the current market practice, several governance models are being considered for DLT adoption within the financial services industry. Among them, and without being exhaustive, some recurrent governance models for developing DLT networks stand out: consortia, joint ventures and statutory organisations. In all cases, proper internal governance as well as protocols around decision-making need to be defined and agreed at the outset, to reduce the likelihood of disagreements occurring in the long term[11].

A **consortium** is established by several industry players and or/Fintech companies that decide to join forces and form together a working group for achieving a common goal but without creating a separate legal entity or independent management structure. This has been a popular choice within the banking sector given its flexibility and ease of set-up. Consortium members share set-up and maintenance costs, pool resources, perform research, and establish the operational and process standards required to implement the DLT solution within their existing infrastructure. Each member has a representative on a steering committee who negotiates and makes decisions on behalf of the company. The consortium model allows members to easily opt in or out without committing capital or requiring the set-up of a formal independent legal entity, independent management, governance, regulatory licences etc. Leading the project effort and decision-making can be time-consuming, and holding specific entities and members accountable may sometimes cause internal conflict between members, particularly in times of uncertainty. This is a business issue that cannot be solved by technology, including DLT.

A **joint venture (JV)** foresees the creation of a separate, autonomous entity established by two or more companies who share ownership, return, risk and governance. Consensus on critical decisions can be achieved more easily, thus resulting in a faster time to market. Since JVs are considered legal entities, accountability protocols and guidelines are defined at the outset and the likelihood of internal conflict is lower than with other governance models. The JV model focuses on pursuing activities that will maximise financial profitability.

A **statutory organisation (SO)** is an independent body whose funding and operations are controlled by a regulatory authority. Participating members will follow the SO's directives and contribute to common objectives. This governance model offers the benefits of transparency and data governance under a regulator that provides transparency, has authority over the process for endorsing standards and monitoring compliance, and ensures that the standards are in line with regulations.

Depending on the governance model selected, different governance questions may arise. In this regard, it's worth noting that the above-mentioned models are referring almost entirely to the DLT technical development but do not necessarily address the organisational governance of a DLT network, which would be essential when shaping DLT for its adoption in financial services. Given the systemic importance of securities

[11] Deloitte, Six Control Principles for Financial Services Blockchains, 2017.

post trade services, regulatory requirements, and the need for adequate investor protection, some form of governance structure for DLT networks providing services in that space will likely be needed.

Each of the three models outlined above will clearly need to be fully in line with the applicable legal and regulatory framework.

2.3 Second level of governance model of DLT framework application: platform

2.3.1 Restricted vs. unrestricted

The mode of participation, restricted or unrestricted, has a profound impact on how the network maintains consensus around the information recorded on the ledger despite faults[12]. How this consensus is achieved impacts the security and economic parameters of the protocol. In a restricted network all participants have been identified and allowed to join the network and it can be assumed that it is in each entity's interest to operate honestly. As such there is less need to employ a capital intensive consensus mechanism to maintain the integrity of the network.

The classic, Bitcoin-like, unrestricted Blockchain model differs substantially from the type of restricted scheme that is likely to be used in financial markets. Participants have to reach consensus over the order of all transactions that have taken place, even when they were not involved as a sender or receiver. Any participant can decide to actively participate in this process and propose batches of ledger updates to the rest of the network. As the network is open to mutually distrusting and anonymous parties, a consensus mechanism has to be employed that protects the ledger against fraudulent or adverse participants that attempt double-spends. In certain cases, this mechanism was established by mining based on the proof-of-work (PoW) scheme. PoW is a probabilistic consensus algorithm that uses economic incentives to encourage validators to update the ledger only with licit transactions. In practice, it requires participants to bear the cost of electricity and hardware to validate transactions. It remunerates such effort only if validated transactions are confirmed as licit by other participants ex post.[13] All participants have to agree upon a common ledger[14] and all participants have access to all entries ever recorded. Since the PoW scheme has

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12 The consensus algorithm of a distributed ledger system can be subjected to a variety of threats, regardless of whether or not malicious, which may affect processes and machines. In this regard, an appropriate level of resiliency should be guaranteed. Crash fault tolerance (CFT) is one level of resiliency that is common in traditional computer systems spread across multiple sites, where the system can still correctly reach consensus, even if components fail. On the other hand, consensus algorithms used in DLT applications are often required to resolve more complex conflicts, such as the Byzantine Fault Tolerance (BFT) problem. This refers to a situation in which some nodes may try to strategically gain from its participation in the network, to the expenses of other participants. The BFT algorithms are designed to formulate methods for reaching agreement in such a situation within the ledger, under some assumptions.

13 See AMI-SeCo report "The potential impact of DLTs on securities post-trading harmonisation and on the wider EU financial market integration".

14 For efficiency reasons, transactions are often validated in batches ("blocks") forming a blockchain.

proved to be inefficient in terms of performance of transactions and energy consumption, developers also consider the proof-of-stake (PoS) and delegated PoS model, where the creator of the next block is chosen depending on its stake in the network (e.g. number of assets owned, collateral, reputation etc.) and can in some cases be chosen (delegated) by other network participants to perform such a role. In practice, participants receive voting rights after posting some collateral either inside the DLT network (native assets) or outside. Such collateral is forfeited if a validated transaction is found to be illicit ex post.[15]

Concerning the data stored on the ledger, privacy can be achieved by means of cryptographic techniques (full anonymisation as in zero-knowledge proof), mixing of multiple transactions (creating confusion over what participants sent/received what amount of an asset), or simple use of pseudonymous identities (participants could then be identified by tracing back their transactions). All these solutions are problematic for applications that require a higher degree of privacy.

Restricted DLT networks have a number of advantages compared to unrestricted systems when it comes to governance issues, scalability or the risk of illicit activities, which makes them more suitable for securities markets. They provide a more fine-grained access control to records and thus enhance privacy while keeping track, in the local node of any participant, of any counterparty they transacted with.

In some restricted models, participation is tiered and the provision of different roles, including reaching consensus and acting on behalf of an end-user to create and thereby invoke transactions, is restricted to specific nodes[16] that check the validity of transactions and maintain a synchronised ledger in accordance with the rules of the scheme.

It is, however, important to clarify that according to the communities involved (open source communities or companies) there are different kinds of consensus on the governance of DLT network which not only implies consensus by validating the nodes but also consensus among the users on the network. There can be, for example, mechanisms for governance developed that will encourage voters to act for the common interest instead of self-interest.

Questions remain regarding the governance standards and they need to be explored further to evaluate how standards are agreed upon and how they are enforced (e.g. messaging, DvP models, account/users' identifiers, product identifiers and reporting).

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15 See AMI-SeCo report "The potential impact of DLTs on securities post-trading harmonisation and on the wider EU financial market integration".

16 Special nodes are often required to vet the validity of a transaction by checking whether it fulfils necessary conditions (e.g. the provision of required signatures). These nodes can also provide a communication channel to clients over which messages containing transactions can be broadcasted consistently across peers and with exactly the same logical order.

2.3.2 General overview of the main DLT frameworks for platform governance

Among the DLT platforms that are commonly used for experimentation in the financial sector, it is possible to identify different approaches to governance.

Unrestricted DLT platforms, whose protocol and code base is generally tested by financial institutions in restricted environments, can have a completely decentralised governance framework. A DLT platform for unrestricted network applications is generally initiated by a single developer (or a team of developers), which is bound to use probabilistic consensus algorithms due to the lack of accountability by users. Governance is therefore generally fully open and may use mechanisms similar to those used for distributed validation (e.g. protocol used by the longer blockchain; higher number of assets/stake, etc.) while a core of developers are often working together, informally or via foundations and their commercial arms, to steer decisions taken by the network of users.

Restricted DLT platforms, which can either be developed ex novo or re-use protocols and applications developed as open source in unrestricted protocols, are typically used (still mainly for experiments) by financial institutions. Since network participants are identifiable and accountable, governance frameworks are also defined along well-defined legal constructs and contractual arrangements. Decisions are still taken for the most part in a shared manner, but they can be steered by a consortium, a joint venture, a statutory organisation, or an individual company/foundation.

2.4 The liability dilemma

2.4.1 Issues identified

Despite the many potential benefits offered by DLT technology, no system or network is free of risks or errors. There are a number of important risks to be considered for any system (be it for use in either a restricted or an unrestricted network) in post trade services, and protections and safeguards to be built in in accordance with regulatory requirements to ensure adequate protection against risks of a market, credit, operational, and legal nature, among others.

The nature and type of risk depends, of course, on the services provided by the network of participants via the DLT platforms and the applications built on top of it, and as such there is no generic answer to how they should be addressed, and what the responsibilities and liabilities of each actor are.

A key consideration in this regard is that in distributed ledgers, while the data integrity may be more secure than in traditional centralised networks, some recent events have clearly showed the need for an analysis of who will bear DLT responsibility for damages in connection with the usage of distributed ledgers.

This refers to data recorded in the distributed ledger but also to the identification of participants in a restricted model, i.e. how it is ensured that the transaction was actually made by the participant alleged. Moreover, the accuracy of the processes performed through the DLT application and integrity of the holdings of assets held within a DLT network are examples of elements which cannot be disregarded when considering the governance of a DLT service in financial markets. Similarly to traditional FMI systems, it is necessary to know who is held responsible if the system fails and what law is applicable, including to determine liability and damages.

In order to better assign liability, we could conventionally divide the DLT hierarchy into six groups. It is worth noting that this constitutes a simplified approach, which will require further elaboration:

1. The developers (such as the core group that sets-up the code design and (de facto) governs the distributed ledger, for instance by having the technical ability and opinion leadership to prompt a change of the system/protocol);

2. The nodes responsible for validating transactions and reaching consensus;

3. The "operator" of the distributed ledger (a concept yet to be defined);

4. Other 'qualified users' of the distributed ledger, such as exchanges, financial institutions;

5. 'Simple users' of the system;

6. Third parties affected by the system without directly relying on the technology;

As a result, when considering DLT from the liability perspective, it is crucial to:

1. Determine the governance structure[17] and entities involved;

2. Clarify which legal, regulatory and industry standards apply to which DLT processes and services;

3. Provide an infrastructure framework that enables secure and stable operation;

4. Ensure the robustness of the IT processes given their great importance for the existence of the firm;

5. Ensure that the algorithms work as intended, ensuring that intermediaries can provide appropriate documentation or data interfaces (to be defined by regulators), which test routines must be embedded in the algorithms, and who has access to the source code and data bases used;

6. Clarify liability and responsibility for any failure of the IT systems and algorithm.[18]

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[17] If a governance model is not reached for a certain application, participants in a DLT network might adopt a pre-defined default approach that is specific to a DLT platform.

[18] The Distributed Liability of Distributed Ledgers: Legal Risks of Blockchain, EBI working paper series 14.

2.4.2 General legal questions related to liability

The legislation applicable to any DLT application would always need to be defined prior to any transaction. Providing specific provisions for issues, such as what law is applicable for liability and which court has jurisdiction, could be a solution. Whereas in unrestricted DLT arrangements such provisions may be difficult to draft, general rules shall be applicable to DLT arrangements based on a restricted network.

Proper governance needs to determine who would be responsible for any malfunction and its consequences – e.g. if an algorithm/smart contract is wrongly encoded, how can it be changed? What is the legal status of the users? How can users be warned about theft of private keys and by whom? How can the Blockchain be secured again?

Currently very few governments have as yet adopted any specific regulatory framework targeting possible DLT arrangements. That does not mean, however, that no law applies. In this case, the law will provide an abundance of generally applicable principles, including the law of contracts, torts, property, partnerships and companies[19].

In the special case of an unrestricted DLT network, it is not immediately possible to identify either the entities involved or their governance roles. For instance, multiple servers functioning as nodes can belong to one legal entity (firm or person), a financial group or multiple unrelated owners.

In conclusion, DLT raises many concerns about liability and answers are yet to be found. Current legislation and regulations are not necessarily fit for or adaptable to a distributed ledger but they can provide applicable principles. Nonetheless, the allocation and attribution of risk and liability in relation to a malfunctioning service should be carefully thought through. Currently, the only available means to allocate the risk of liability seems to be through clear contracts, negotiations and agreements that need to be compatible with the regulatory framework and address the specificities of the application and network under consideration.

The development of appropriate governance will be even more important for the DLT network in order to handle IT changes. It will guarantee a clearer framework for the liability of the legal entities involved regarding data management and processes, and will ensure sufficient cyber resilience of shared and local infrastructures. Furthermore, access and interoperability also represent important components to accelerate the integration of new and existing infrastructures.

Similarly to FMIs[20], if they are not properly regulated DLT networks can be exposed to cyber risks and form a channel through which financial shocks can be transmitted across domestic and international financial markets. In this regard, the DLT governance should be designed to mitigate these risks and respond to cyber-attacks.

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19 The Distributed Liability of Distributed Ledgers: Legal Risks of Blockchain, EBI working paper series 14.

20 Cyber resilience oversight expectations (CROE) for Financial Market Infrastructures.

2.4.3 Building on existing structures

The current post-trading landscape is built around FMIs. These infrastructures exist with the express purpose of providing shared processes that are explicitly designed to reduce cost and various types of operational complexity and risk. FMIs are often subject to regulation and carry liability provided for by their contractual arrangements and jurisdiction or reference.

In a set-up where the data is distributed across entities and there is an entity that does the product management, the split of maintenance of the application/smart contracts could be the following:

- a restricted DLT network that incorporates economic mechanism design into the protocol to provide the FMI service in a form similar to a member mutual, and
- a scheme owner for the specific off-chain financial asset held on-chain that protects the legal standing and stability of the said asset.

Some examples of distinctions that could be drawn between the functions are set out in Table 1.

Table 1
Examples of distinctions of functions

Network Protocol (Blockchain)	Scheme Provider (Asset Regulation)
Process and Operation	By Traditional Legal Entity
Align Profit and Risk	Relationship with Regulator
Changes by Voting	Veto/Appeal over Membership
Rewards and Payments for Protocol Upgrade Proposals and Other Enhancements	Enforced Regulatory Protocol Upgrades

In one example a consortium, JV, or statutory organisation could be an entity that builds and maintains the network protocol and takes up operational liability. Existing FMIs could become scheme providers, keeping their legal liability to some extent.

The members are responsible for the network. This type of governance is suitable for the operational elements of an FMI.

Any FMI which functions based on a DLT protocol will require a regulated entity that is responsible for ensuring that the rules and technical standards are appropriate and meet any regulatory requirements and, in particular, provide Legal Basis and Governance.

The split of responsibilities needs to be carefully divided so that responsibility is clear in all situations. And that responsibility will need to be reinforced with the appropriate economic and regulatory incentives.

3 Transparency of holdings: a possible basis for reaping the benefits of innovation in post-trading

3.1 Introduction

The DLT-TF, the predecessor to the Fintech-TF, addressed the issue of how to ensure market participants in the holding chain have consistent information on end beneficiary and a vetted channel to transfer electronic information[21]. The use cases presented in this report build on the approach presented by the DLT-TF, which is therefore outlined here[22].

3.2 Overview of current processes in the field of shareholder transparency

The term shareholder transparency refers to the possibility for an issuer or its agent to identify shareholders and gather all information needed to involve them in the company decision-making and the company to meet the obligations on shareholders set for the relevant parties.

3.2.1 Information gathering process

The process of collecting information on shareholder identities is complex, as it usually involves multiple layers of intermediaries (e.g. registrars, Central Securities Depositories (CSDs), direct CSD participants and indirect CSD participants) between an issuer and its shareholders.

First, the issuer or its agent needs to check who its shareholders are at the level of CSD participants. When some of them are not the ultimate beneficial owners but rather nominees, the issuer or issuer's agent needs to send a similar request to ask them on behalf of whom they hold the securities and which among their clients are beneficial owners rather than further nominees. This multiple-step process goes on at all further layers down the holding chain (see Figure 1 Current process of information sharing for registration purposes adapted from the report of the T2S Task Force on Shareholder Transparency (ST-TF)) until the intermediary (hereafter called "last intermediary") who deals directly with end investors at the end of every branch of the chain is reached and can disclose end investors' information. As a result of various technical difficulties, intermediaries often experience difficulties in disclosing the

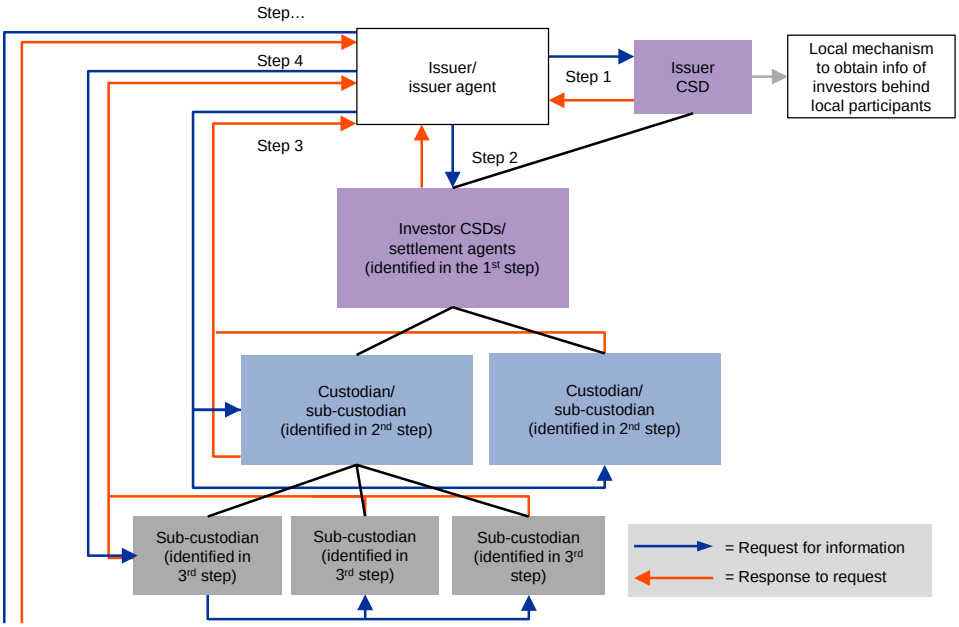
[21] See DLT-TF follow-up work on shareholder transparency.

[22] The disclosure of shareholder information feeds the shareholder registration process, on which the AMI-SeCo requested follow up work and that is strongly linked to national specificities.

information on time. Legal barriers to cross-border disclosure of information are also a substantial obstacle until SRD2 is implemented by Member States.

Figure 1

Current process of information sharing for registration purposes



3.2.2 Possible remaining challenges in the area of shareholder transparency

The entry into force of the recast SRD will remove the above mentioned legal obstacles to the current transmission of shareholder information, including transmission via cross-border holding chains. However, currently there are no solutions that can be considered ready to avoid fragmentation of the processes that financial intermediaries will need to follow to address requests received from a number of issuers using different communication channels and different types of chains of intermediaries, or to allow their clients/shareholders to participate in general meetings (casting their votes either through the chain of intermediaries or directly with the issuer).

If they are not addressed by means of a market solution built around existing and yet to be agreed standards, processes regarding shareholder transparency may add substantial overhead costs to the back offices of market participants. That is likely to increase the costs of shareholder information disclosure and may justify or even engender industry work to set up a utility service yielding network and scale economies, possibly by means of “modern technologies” as explicitly suggested in the SRD2. The SRD2 requires intermediaries to publicly disclose any applicable charges for the identification of shareholder identity and the exercise of shareholder rights, and differences between the charges levied on the domestic and cross-border exercise of

rights shall be permitted only when duly justified. Moreover, Member States may prohibit intermediaries from charging fees for the identification of shareholders, transmission of information and facilitation of exercise of shareholder rights.

The lack of a European harmonised definition of the term “shareholder” leaves the interpretation of the term to EU Member States and manifests the existing differences in the EU[23]. In the EPTF report this has also been referenced under the Barrier 5 and calls on the Private sector, the EU Commission and the EU Member States to address potential solutions.

3.3 Fintech-TF suggestions to address open issues via use of technological innovation

The Fintech-TF found usage of synchronised bilateral ledgers, which is a particular application of DLT, to be the innovative technology that fits best to create a network for the purpose of this use case. Updates in the network would be governed by smart contracts.

3.3.1 Identified technologies of relevance

Synchronised bilateral ledgers are a type of DLT where two counterparties can update the subset of information that refers directly to their bilateral activity and thus allows bilateral sharing of information between the two parties in the distributed ledger they share. This information can then be made further available to other parties in the network. Use of synchronised bilateral ledgers could be a solution for facilitating transparency of holdings involving all intermediaries through the chain, while at the same time meeting the necessary confidentiality requirements since no central party needs to know all the information.

Three reasons why the use of synchronised bilateral ledgers is considered are:

1. The validation process ensures confidentiality of data. A centralised approach to track changes in the identity of the last intermediary responsible for any holding of shares, while ensuring participation of all intermediaries for information accuracy purposes, would require a central entity to be aware of all bilateral relationships among intermediaries in the custody chain. This could pose issues with regard to confidentiality and professional secrecy, as well as an operational overhead as the central entity would need to process all bilateral transfers that take place and connect them to ensure consistency. That approach requires that only the relevant account provider is able to see and validate record updates involving holdings of its clients, one level below in the holding chain. A similar validation process shall therefore happen at every step in the holding chain, where intermediaries at each level of a branch would validate record updates involving their clients’ accounts. Confidentiality of data and the rights of

[23] The definition of shareholder depends on applicable national law. That matters especially in the case of funds, where it will be necessary to clarify the potential role of asset managers in an IDD network.

shareholders to amend the data or have it deleted (Article. 3a(4-5) SRD2) could be an issue if end investor information were shared in the distributed ledger[24]. The Fintech-TF approach would be to store end investor data in the proprietary systems of authorised institutions (issuer and/or its agent), whereas the only information that is distributed and on which consistency is collectively enforced should be the list of last intermediaries responsible for providing the information.

2. It is necessary to involve all intermediaries along a holding chain to ensure that the number of securities on which the last intermediary reports investor data is consistent with the holdings allocated to that intermediary. The participation of middle-layer intermediaries appears to be in line with the SRD2, which envisages their involvement in the information flow related with shareholder identity.[25] An alternative solution, where the issuer agent would manage a centralised database on the basis of information received from the last intermediaries with no vetting by intermediaries in the middle of the holding chain, would be prone to mistakes. Another solution could foresee the use of application programming interfaces (APIs)[26] across all intermediaries who participate in any specific holding chain and transmit information automatically upwards. However, developing a common API outside a specific service such as the IDD could be unfeasible due to the lack of governance coordinating the involvement of different IT systems.

3. Information on shareholders should reflect the outcome of settlement. Information on the intermediaries involved in a holding chain down to the ultimate shareholders should be updated following confirmation of settlement in the legally binding accounts of the intermediaries and infrastructures involved in every transaction. Therefore, it is necessary that the intermediary or market infrastructure receiving matching update requests from two of its clients should provide ultimate assurance that all bilateral ledgers affected by change of holdings reflect the outcome of the settlement process.[27]

The Fintech-TF members see potential value in the use of shared bilateral ledgers to update a directory, which could be used as a source to gather relevant information on its shareholders efficiently from their account providers. This concept has been provisionally named Investor Data Directory (IDD). With this DLT solution, counterparties might update the subset of information that refers directly to their bilateral activity (possibly with other elected parties also accessing these records) and ensure consistency of data held at different locations while protecting confidentiality.

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[24] In theory, the IDD platform would be able to store information on end investors directly, however that is unnecessary and any decision on this is a matter of specification of the service requested by participating institutions.

[25] See art. 3a(3) para.1 of the Directive (EU) 2017/828.

[26] APIs are used by software developers to reduce the amount of work needed to develop software by standardising information exchange between programs.

[27] Frequency of the updates and different approaches to it are covered under *Frequency of IDD updates* -paragraph under section 3.3.3.

3.3.2 High-level description of the use case

The DLT-TF started reflections on a service that could address issues around shareholder transparency, on the type of functionalities that such a service should include, and on whether any type of DLT could add value on top of a more traditional approach based on a centralised database and reconciliation via peer-to-peer messaging. The analysis has been developed further by the Fintech-TF. As presented, the use case reflects one possible approach for the industry and other relevant actors to address the EPTF barrier 5: *Lack of harmonisation of registration and investor identification rules and processes*[28].

The DLT-TF took stock of past work conducted on the topic by the T2S Taskforce on Shareholder Transparency (ST-TF), which in 2011 put forward four possible solutions for the workflow related to cross-border shareholder information.[29]

Participants in an IDD network would be financial intermediaries and market infrastructures. Securities holdings would be represented by tokens held by IDD participants. The IDD would not provide any settlement service. It would only facilitate sharing of information on positions after settlement of transactions, which happens by traditional means in the standard custody chain, is then confirmed to all intermediaries involved and those intermediaries reflect the confirmed changes of holding in the IDD database. Changes in securities holdings in the legally binding custody chain would be reflected in the IDD by means of transfers of tokens, which are governed by smart contracts initiated and validated by IDD participants only once settlement of a transaction has been confirmed to all parties involved in the custody chain.

IDD updates would be governed by smart contracts that are linked hierarchically to reflect relationships in the traditional and legally binding custody chain. In the description of an IDD solution we shall sometimes differentiate between “contracts” and “sub-contracts”, to specify when a smart contract (sub-contract) has to abide by the rules of the contract from which it has been derived. Besides the hierarchical aspects, these will all be smart contracts requiring signatures from parties involved to update the ledger in which they are executed.

Looking at the right side of a smart contract deployed by account provider “A” (e.g. CSD) in Figure 2 to one of its account holders “B” (e.g. a CSD participant), this would allow the latter to transfer a number of tokens to another network participant “Z” (e.g. a CSD participant) on behalf of its clients, which could either be end investors or intermediaries further down the traditional custody chain. If the transfer of tokens happens on behalf of intermediaries further down the custody chain, say on behalf of intermediary “C”, the transfer of tokens shall be governed by a sub-contract that B deployed to C in accordance with the contract it initially received from A. This step

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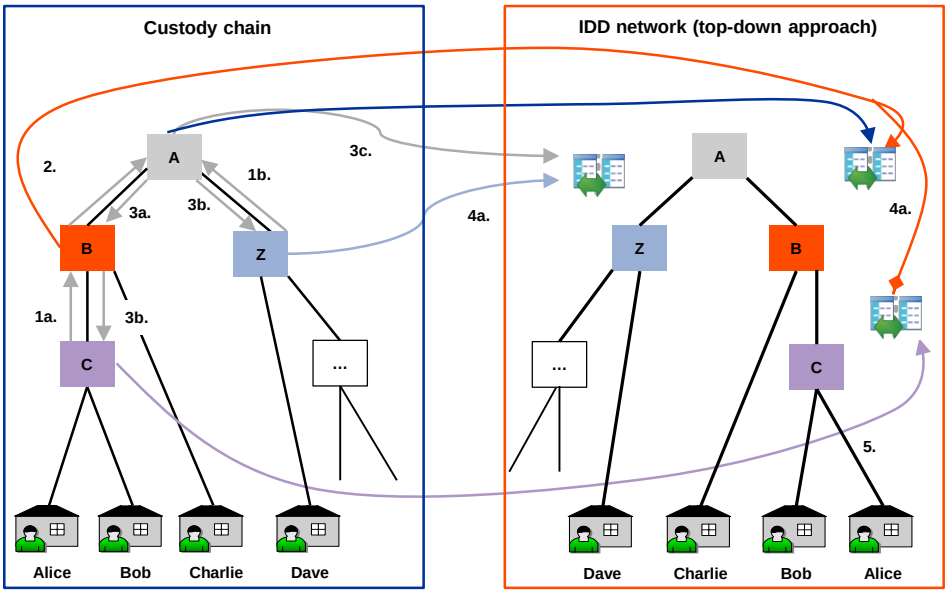
[28] EPTF report, p. 52.

[29] The ST-TF divided its proposals into “decentralised” solutions, operated by intermediaries among themselves, and “centralised” solutions, which used the T2S platform as a central reference for either account balances or messaging at the level of CSDs and CSD participants. The ST-TF concluded however that a decentralised approach would be needed to allow gathering information from layers of the holding chain other than T2S participants, and suggested that an ad-hoc messaging standard could improve its efficiency. The DLT-TF proposal builds on the ST-TF work and focuses on a decentralised approach outside the T2S platform. For details, please see the published ST-TF report to the T2S Advisory group (AG).

would take place only a limited number of times, during the set-up phase of an IDD and in the case of updates agreed by the IDD governance in relation to any specific issue.

Figure 2

Workflow of the IDD (top-down approach)



The holding chain can of course be much longer, with C and Z deploying their own sub-contracts to their client intermediaries and so on, but it is assumed here for the sake of simplicity that C provides accounts to some end investors (“Alice” and “Bob”). In the graphical representation it is also assumed, for the sake of simplicity, that Z is a direct participant of A, who is then its account provider and deploys the related smart contracts, and that Z provides accounts to some end investors (in the graphical representation, “Charlie”).

As the settlement of a security transaction takes place and shares are transferred from a client of C to a client of Z, a transfer of tokens representing those shares in the IDD shall be initiated. Two approaches can be considered:

1. In a top-down approach, which is described in figure 2, the IDD participant A who received matching instructions in the custody chain (steps 1b-2) shall confirm settlement (steps 3a-3b) and will initiate a smart contract updating the bilateral ledgers it holds with its clients accordingly.

   Participant A would do so by initiating and signing a smart contract to update the two bilateral ledgers it holds with B and Z (step 3c). That means a transfer of tokens from B to Z would be ready to take place. Z can already apply its signature to the smart contract updating its bilateral ledger with A (step 4a), declaring itself as the candidate last intermediary in the chain for those tokens (still subject to confirmation from the branch stemming from B). B is aware that the transfer involves its account relationship with C, who is not an end investor. It then signs

the sub-contract initiated by A, to update their bilateral ledger, and makes execution of this update conditional on successful updating of its bilateral ledger with C. When C signs the sub-contract in its role as last intermediary in that branch of the custody chain, the transfer of tokens takes place and the IDD is updated.

2. In a bottom-up approach (not depicted in Figure 2), the last intermediaries who initiated a securities transaction in the custody chain for their end investors (buyer and seller) would initiate the ensuing update in the IDD. The smart contracts called by the two last intermediaries C and Z are sub-contracts written in such a way that they can only be executed if the respective contracts held by B and A are also signed. The two latter ones would then have to use their signatures to testify that the transfer of tokens corresponds to a confirmed settlement in the custody chain.

   The contract used by B, however, is itself a sub-contract of the one used by A and it needs A to guarantee with its signature that the same instruction was settled and confirmed in the legally binding custody chain. The transfer of tokens takes place the moment A has approved the requests it received from B and Z, as no further contract up the chain is needed to achieve the matching of IDD instructions.

   The same would be true if the smart contract used by A was a sub-contract of another contract further up the holding chain: as long as an intermediary is involved that has visibility of both bilateral ledgers, no additional signature is required.[30]

At the end of any of the two processes outlined above, the information available to the issuer or issuer agent is updated and shareholder information can be obtained by means of the pull or push approaches described in section 3.2.1.

A potential solution to allow interfacing between the traditional holding chain and the IDD network is one where institutions in the traditional custody chain provide their signature of IDD smart contracts waiting for a signed sub-contract to instruct a movement of tokens that matches the content of their settlement confirmation – i.e. ISIN, quantities/prices, and parties involved. Authorisation of the transfer of tokens via signature of a smart contract execution could therefore be provided automatically as soon as settlement of a transaction is confirmed in the traditional holding chain.

[30] This case would only be valid for internalised settlement in the custody chain, and the process of updating the IDD would similarly require no intervention from intermediaries further up the custody chain.

Initial distribution of IDD tokens and smart contracts

Each IDD token could represent responsibilities over shareholder identification for a single share (or potentially over fractions of a share).[31] Deployment of tokens and of smart contracts governing their transfer is described here for the top-down approach.

The IDD service provider (e.g. an issuer agent) could customise a generic IDD smart contract agreed at the level of IDD governance to allow its use for a specific ISIN under its responsibility.[32] The institution at the top-tier holding level, i.e. the issuer CSD, would deploy such a smart contract to its direct participants in the first information layer and would allocate to each of them a number of tokens reflecting individual holdings. Each IDD participant in the first information layer would have the possibility of deploying the tokens it received from its own account provider to its account holders, together with sub-contracts of the IDD smart contract it received for that specific ISIN, and that will allow further future transfers[33]. Tokens and sub-contracts would be allocated based on the holding of each account holder in the traditional and legally binding holding chain. A similar process of deployment of tokens and of sub-contracts governing their transfers would allow distribution across intermediaries at all other layers of the holding chain represented in the IDD network.

What the use case shall achieve: Pull vs. push approach

Two different ways to obtain the end investor's information have been considered: (1) information pulling method, by which the IDD provider, or any other entity delegated to maintain the register would contact the last intermediary holding any number of tokens in order to obtain (pull) information from the end investors; (2) the information pushing method, whereby the last intermediary who holds any number of tokens is responsible for sending (pushing) information by updating the IDD provider or any other entity delegated to receive such information.

The pull approach would make it possible to achieve the most basic objective of an IDD service, which is to provide issuers, their agents, or any legitimate interested parties, with an automatically updated directory of the last intermediaries in every branch of the custody chain – i.e. which intermediaries have relevant information on end investors, similarly to what is reported in the example in Table 2. This would allow the interested party to pull such information by directly contacting the relevant intermediaries[34].

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31 If IDD tokens were to represent fractions of shares, a common denomination would be necessary – e.g., every token could represent one hundredth of a share. That could be linked to the concept of minimum settlement unit.

32 Provisions that are specific to a jurisdiction, such as the thresholds on minimum holdings that justify reporting of shareholders' information to the issuer or to its agent, can be encoded in the smart contract used in each ISIN-specific IDD ledger under the national law of the issuer.

33 If an intermediary does not take part in the distribution of tokens and smart contracts, it will have to find alternative ways to comply with the requirements set in the recast SRD.

34 It shall be noted, with reference to tables 2 and 3, that the number attached to each share does not dispute its fungibility. Rather, it would represent the number of the corresponding record. The same information could be represented as a quantity entry specifying the number of tokens under its responsibility next to the name and contact of each information keeper.

Table 2

Example of information visible to an issuer/agent via IDD (pull approach)

ISIN: XXXXXXXXX (assuming 10 shares were issued)		
Share #	**Information keeper**	**Contact of intermediary (BIC/LEI, Phone, Address, …)**
1	Intermediary “1”	XFLBUS…, 305-613-83.., Tree Plaza, Miami, FL , USA, …
2	Intermediary “2”	XTSBDE..., 069-134-…, 4894 Berger Straße, FFM, DE, …
3	Intermediary “2”	XTSBDE..., 069-134-…, 4894 Berger Straße, FFM, DE, …
4	Intermediary “2”	XTSBDE..., 069-134-…, 4894 Berger Straße, FFM, DE, …
5	Intermediary “2”	XTSBDE..., 069-134-…, 4894 Berger Straße, FFM, DE, …
6	Intermediary “3”	XFLDORU…., 012-563-…, 24 Rue du Mail, Paris, FR, …
7	Intermediary “3”	XFLDORU…., 012-563-…, 24 Rue du Mail, Paris, FR, …
8	Intermediary “3”	XFLDORU…., 012-563-…, 24 Rue du Mail, Paris, FR, …
9	Intermediary “4”	XXMKDU…., 067-237-…, 237 Via Nazionale, Roma, IT, …
10	Intermediary “4”	XXMKDU…., 067-237-…, 237 Via Nazionale, Roma, IT, …

The issuer or its agent would not need to contact every intermediary in the holding chain to finally get shareholder information from the last intermediary. Only the last step would be needed and the request/response could be channelled via the messaging functionalities of the IDD service.

The push approach would represent a more sophisticated solution, where the IDD could be used to allocate tokens to the last intermediary in every branch of the custody chain. The last intermediaries could use the tokens as a proof of their entitlement to fulfil their obligation of updating shareholders’ information (to push an update), in a separate database under the exclusive responsibility of the issuer, its agent, or any other authorised party who would ensure confidentiality of data. The envisaged outcome is represented in Table 3.

Table 3

Information visible to an issuer/agent in proprietary database with access control via IDD (push approach)

ISIN: XXXXXXXXX (assuming 10 shares were issued)		
Share #	**Intermediary which updated record**	**Shareholder contact details (Name, Address, …)**
1	Intermediary 1	Jane Smith, 4894 Golden Street, Miami, FL , USA, …
2	Intermediary 2	Erika Mustermann, 20 Kaiserstraße, FFM, DE, …
3	Intermediary 2	Erika Mustermann, 20 Kaiserstraße, FFM, DE, …
4	Intermediary 2	Lieschen Müller, Löwenstraße 230, München, DE, …
5	Intermediary 2	Lieschen Müller, Löwenstraße 230, München, DE, …
6	Intermediary 3	Paul Martin, 179 Allée de Brienne, Toulouse, FR, …
7	Intermediary 3	Paul Martin, 179 Allée de Brienne, Toulouse, FR, …
8	Intermediary 3	Jean Dupont, 302 Rue Saint-Roch, Paris, FR, …
9	Intermediary 4	Mario Rossi, via Luca Bianchi 128, Roma, IT, …
10	Intermediary 4	Mario Rossi, via Luca Bianchi 128, Roma, IT, …

With such a solution, the interested party would not even need to bilaterally ask the last intermediary in each branch of the holding chain for shareholder information – the

intermediary would be responsible for updating shareholder information either in real-time, or at pre-specified intervals, or upon public request from the issuer.

The HSG deemed the push approach theoretically superior to the pull approach in terms of service levels, since it makes it possible to completely resolve the inefficiencies related to the current process of gathering shareholder information. The push approach, however, would require much more storing and updating of information on a continuous basis (i.e. for each change in position). The pull approach, on the other hand, would be sufficient for issuers to gather information "on demand" by identifying which intermediaries hold information on the identity of their shareholders. Still, the pull approach requires standardised messaging across all ISINs involved to allow swift communication between the last intermediaries and the issuer or its agent.

3.3.3 Remaining issues and constraints

The IDD service shall provide a standardised way for any issuer (or its agent) to gather relevant information on its shareholders efficiently from their account providers. That will certainly require an industry-wide standardisation effort to ensure that a common data structure can be used across all ISINs by all intermediaries in the custody chain. This in turn requires governance (a topic to be expanded with regard to this and other use cases), not only to set up the service but also to maintain and update it.

Netting: Records in the IDD distributed ledger are intended to reflect, and spread information related to, positions already settled in the proprietary database systems of intermediaries in the traditional holding chain. That means that participants in the IDD do not need to process settlement instructions, e.g. with a view to implementing netting algorithms, but they should only reflect changes in positions whose settlement is confirmed in the traditional system. It does, however, require a parallel updating process to reflect any change in positions, including cases where position changes are not happening on the books of the CSDs (e.g. internalised settlement, or as a result of non-settlement related activities, e.g. corporate actions).

Frequency of IDD updates: The IDD could be updated either continuously or upon request/at end of day. Information about shareholders can either be flow-based (which means that information is constantly updated on a real time basis as result of settlement of transactions in a security) or stock based (information is updated at certain intervals in a 'snapshot' like manner, i.e. as a result of specific events such as an annual general meeting (AGM), request from the issuer, etc.).

A flow-based approach would allow the IDD service provider for any ISIN to automatically receive updated information on the last intermediaries/end investors at any time and would allow any operational issues to be solved ahead of key events such as general meetings or record dates. Any changes in the holding chain (whenever settlement takes place, theoretically even intraday) would immediately be reflected upon settlement. Since servicing is tightly linked to the recording of holdings in most national markets, a flow-based approach could have a material impact on the business model of the last intermediaries in holding chains. Moreover, the

processing/cost overhead[35] is yet to be determined and a flow-based approach could be heavy to implement as this replicates any movement in the custody chain and could require a large degree of parallel processing.

If easy interfacing is not feasible, a stock-based solution where updates take place only upon justified request (semi-manual process) or at the end of each business day (automated process dealing with ledger updates in batches or even only at relevant dates, for example preceding an AGM) appears more feasible and may still suffice to make shareholder information available with a frequency that allows substantial efficiency gains in the area of shareholder transparency. Optimal timing in this case is still an open question and should be based on the experience of intermediaries with regard to their reconciliation processes as well as on legal analysis. As intermediaries in the custody chain carry out regular reconciliation processes at different intervals, the timing of these processes and the consequent change in the information fed into the IDD service would likely guide any decision in this respect.

From a legal perspective, the update of the IDD would be intrinsically linked to the moment when the acquisition of the shareholder status becomes effective. The information in the custody chain is based on settlement. However, rules governing the transfer of ownership and whether the binding data is based on the trade date or the settlement date may vary across jurisdictions. Such heterogeneity would need to be reflected in the overall functioning of the IDD service and especially in the coding of its ISIN-specific smart contracts.

Interoperability with traditional systems: Replicating transfers from the settlement/custody chain to the IDD should not be an issue if IDD participants were able to use APIs to translate their settlement confirmation messages directly into equivalent instructions executing/signing IDD smart contracts (a feature whose practical feasibility is still to be assessed). Interfacing between the traditional systems of financial intermediaries and an IDD needs to be assessed to ensure that updates in the IDD ledger happen automatically upon confirmation of settlement (or at any specified cut-off time) and that any possible malfunctioning of the service can be identified by means of regular reconciliation mechanisms. An IDD platform should be designed in compliance with the SRD2 and its technical standards.

Duration of positions held by individual shareholders: is another important feature that an IDD solution could provide and add as a service to the current custody chain, allowing issuers to grant additional rights to shareholders that have held their positions for a long time. The classic example is double voting rights, as well as some other bonus rights whose allocation requires shareholder information to be updated in the shareholder register. With a stock-based solution, the issue may arise of how holdings should be computed when inflows and outflows of securities happen at different points in time. Whereas some national markets or issuers may envisage a first-in-first-out (FIFO) approach, in other cases a last-in-last-out (LIFO) approach may be warranted[36]. That should be customisable in an IDD service. The question of what

[35] It shall be noted that an IDD participant only processes updates that have taken place at the level of its accounts and does not intercept the rest of the network traffic.

[36] See e.g. the case of prime de fidélité (fidelity premium) in the French market.

happens if there are discrepancies between positions which are reflected in the IDD vs the books of the registrar remains open.

Broken branches and the possibility of different fragmented solutions being developed: If an intermediary dealing with a certain security does not participate in the IDD network, the information stored in the distributed ledger can only be updated up to the level of its account provider, while its own account holders are cut off (concerning the share held with it). An intermediary that does not participate would impede its account holders' access to the IDD service and would force them to respond to issuers' requests by means of alternative and possibly more expensive solutions. Participation in the IDD network cannot be compulsory and all intermediaries would face the choice between joining it, or finding alternative ways to comply with SRD2 implementation. The cost-efficiency of the IDD solution, as well as competition from possible alternatives, would be the drivers of possible adoption. That is particularly important at the top levels of the custody chain. As long as the issuer or its agent cannot oblige intermediaries to participate in a specific IDD platform, its use will depend on subjective cost-analysis by each entity and that may limit the advantages brought by a common IDD. One or more service providers could allow intermediaries who, possibly due to the volume of their activity, do not have an interest in setting up the necessary IT infrastructure to participate directly in the IDD service, to participate indirectly by delegating the translation of their internal confirmation messages into instructions that are compatible with the functioning of the IDD.[37]

3.4 Conclusions and way forward

The process of collecting shareholder information is complex and burdensome, as it is not automated and usually involves multiple layers of intermediaries. The SRD2 aims, among other things, to harmonise the shareholder identification process, thereby facilitating the exercise of shareholders' rights. More specifically the recently adopted Implementing Regulation, by means of its harmonised rules on content, format and deadlines, should enable smoother, more efficient and reliable transmission of information by intermediaries, thereby facilitating the processing of messages and ultimately the exercise of shareholders' rights. It is therefore expected to trigger market initiatives. The use case presented in this chapter is to build a utility-service for a decentralised directory of information to identify beneficiary owners using distributed ledger technology.

The initial distribution of tokens would be initiated by the first intermediary using smart contracts which allocate a number of tokens to its direct participants reflecting their individual shareholdings and each intermediary would further distribute these tokens through the custody chain until the last intermediary is reached.

Any further IDD updates would be governed by smart contracts, either (i) top-down, starting from the top of the custody chain or (ii) bottom up, initiated by the last

[37] See e.g. SWIFT, where only 4,000 BICs out of 11,000 are self-managed.

intermediaries of the buyer and the seller. The frequency of such updates can be either continuous, at the end of the day or upon request.

To facilitate shareholder identification, two methods can be used: either (i) the IDD provider (on behalf of the Issuer) pulls end investor information from the Last Intermediary or (ii) the IDD provider pushes tokens to the last intermediary as proof of entitlement to allow the latter to update shareholder information in a separate database under the exclusive responsibility of the Issuer. The HSG has deemed the push approach theoretically superior to the pull approach, though that needs to be weighed up against the greater complexity and cost of a system based on the push approach, versus the pull approach.

The use case developed in this paper is to build a decentralised ledger of shareholdings called Investor Data Directory (IDD) using shared bilateral distributed ledger technology. An IDD provider would push tokens reflecting the holdings of the shareholders to the last intermediaries in the holding chain and the shareholders could then cast their votes electronically using the tokens.

The IDD service could eventually be applied to a broader range of further challenges, if appropriately designed, without a foreseeable need for significant further investment.

Initially the new system should have a lean but expandable scope. Beyond the topic of identification and disclosure of shareholder information, the platform could be leveraged to allow electronic voting, communication on portfolio transfer information, (e.g. tax information in countries such as Italy and France, or beneficiary information for MiFIR), processing of cash flows at source with no need for tax reclaim processing and reporting, and enhancement of existing manual processes in the corporate actions space.

In view of the above, we recommend that key market players combine forces to develop a shared market utility or at least, agree on smart contract and investor data standards to ensure interoperability between different solutions that may arise. While DLT has some obvious benefits which could facilitate the functioning of such a utility, it is not the only possibility and it cannot be excluded that the same required functionalities might also be offered using more traditional technologies.

4 Corporate actions information

4.1 Introduction

To follow-up on the finding of the HSG DLT-TF on the impacts of DLTs in the field of corporate actions[38] the Fintech-TF started work on a possible DLT use case in this regard and on also exploring innovative technologies beyond the DLTs, that could be relevant in this area. In particular the Fintech-TF agreed to explore whether and how innovative technologies could be used to create a single database that could be accessed to retrieve validated information on corporate actions by all parties involved in the processing of CAs through the custody chain. Ideally such a source would be identified as a "Golden Copy", i.e. a single source of accurate and confirmed information relevant for the processing of corporate actions that are announced by the issuer or its agent by means of standardised, electronically readable, consistently formatted messages.

As an alternative approach to the concept of the "Golden Copy" this analysis presents the idea of a "Trusted Copy" of corporate action information. One main difference in the operational processes between the two is that in the Golden Copy the information is provided by the issuer or its agent, whereas in the Trusted Copy there is a collective effort to supply, review and improve the information. This leads to a fundamental difference between Trusted Copy and Golden Copy in terms of the allocations of liability when other actors than the issuer/issuer agent provide or improve the data. An example of a Golden Copy model could be considered implemented in the Italian market where for most types of corporate actions the Issuers/Issuer Agents provide the CSD with information relevant for the processing of corporate actions.

Meanwhile, the use of trusted copies is being considered in the Swiss market, partly relying on DLT as already described in paragraph 4.3.4

4.2 Overview of current processes in the field of CA information

Currently, information relevant for the processing of corporate events passes through a number of different proprietary systems, each with their own maintenance costs and the multiple data feeds and data scrubbing tools needed to "select" the information relevant for corporate action processing, before the information made available by the issuer reaches the end investor. Information normally enters this chain of intermediation in a non-standardised, semi-manual manner. Transmission of information along the chain is adapted for straight-through-processing (STP), but interoperability issues may emerge in an environment with a multiplicity of proprietary

[38] Follow-up analysis for the HSG Task Force on Distributed Ledger Technologies (DLT-TF) on Issuer Corporate Actions Golden Copy.

systems involved, updates and maintenance they require and the need to use data scrubbing tools to select the information relevant for processing corporate actions.

4.2.1 Setup of corporate events and communication through the holding chain to investors

As a precondition to processing corporate actions, issuers or their agents are expected to communicate information concerning the corporate events to their domestic CSD or issuer CSD. The method for doing this is not standardised and issuers in general do not provide information in an international standardised machine readable format. Information is usually included in the legal documents or announcements published by the issuer or issuer agent, or through the completion of an electronic/paper form detailing the corporate actions. Information is subsequently entered into CSD systems in a semi-manual process. Where the issuer or its agent does not input the relevant information directly in the holding chain, entities in the chain have to collect data from specialised data vendors or data feeds, and then "scrub" the data to validate it and to determine how conflicts between different sources can be resolved.

Once relevant information has been injected in the chain, issuer CSDs and other intermediaries transmit them down to the chain to the end investors. Depending on the type of corporate actions, unformatted messages or email/fax are still used.

SRD2 requirements related to the transmission of corporate actions information will support the electronic transmission of the information flow between issuers/issuer agents to CSDs and other intermediaries in the chain, however the effectiveness of such improvements still need industry market practices to develop in terms of the content of the announcements[39].

Similar issues occur where the information flow works in reverse, with end investors instructing their bank, and so forth up through the custody chain until the information reaches the issuer CSD (and/or the issuer or its agent, where necessary).[40]

4.3 Fintech-TF suggestions to address open issues via use of technological innovation

The Fintech-TF considered it worthwhile to broaden the assessment of possible technologies beyond the DLT. At this stage no innovative technologies were ruled out as irrelevant from the outset. For example, greater automation of contracts is considered to be a feature that should be looked into in more detail, including whether and how it could be applied for corporate actions announcements. Furthermore, the use of information extraction and machine learning techniques could be relevant to address issues in this area.

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[39] See article 2 paragraph 2 and 3 of Regulation (EU) no. 1212/2018.

[40] This circumstance would also be the case for electronic voting events, as well as for the transfer of end beneficial owner data necessary for the processing of events, for example tax certificates.

4.3.1 Application of Distributed Ledger Technologies (DLTs)

In the field of DLT smart contracts and smart contract templates, and applying these DLT features to the use case on corporate actions information and the Trusted Copy in particular, three issues are considered to be significant, namely i) machine readability of smart contracts, ii) public availability of information and iii) processing of smart contracts. As i) and ii) are a prerequisite to iii) this business case will mainly focus on the first two points. The processing of the smart contract is also closely related to the processing of the CA, which is out of the scope of this document.

With regard to machine readability, the adoption of “smart contract templates” could facilitate the translation of legal information into standardised formatted messages, which could be computer-read and used as input for the underlying smart contract. In a similar fashion, the information contained in these templates, according to the standard, may be made publicly available by distributing the contract along the DLT, therefore ensuring intermediaries will not bear liability in the case of inaccurate information due to formatting mistakes. Depending on the implementation, DLT can be used by retaining the liability for the information input in the ledger with the issuer or distributing the liability in the form of a trusted copy. In implementation models where information in the ledger was input by the issuer as final it could be agreed that the issuer assumes liability for the information as it is in the ledger. In other implementations where the information could be amended by intermediaries the issuer could not be held responsible for data inserted in the ledger[41].

The machine readability aspect is closely related to standardisation. The better the standards are, the higher the quality of the information is, and the closer to the objective of a golden copy the result is. When using a smart contract template the issuer is ‘forced’ to comply with certain standards. This is the same functionality as the ‘centralisation’ concept described in section 4.3.5 below, but in the DLT context it is decentralised, and does not rely on one central party for the operations.

The availability of the smart contract along with the DLT creates one source of accessible information to all participants, which would in itself be a step forward towards better information sharing in the area of corporate actions. Based on the role of the participant in the DLT network, the smart contract information could also be enriched, and again increase the value of the trusted copy.

One difficulty when using smart contracts on DLTs is related to unpredictable events and how to update the smart contract rules in such cases. For predictable events the smart contracts could be created at the time the security is issued and they would remain unchanged through the lifecycle of the security. Updating the smart contract for unpredictable events requires significant programming and possible re-certification of the entire smart contract.

The DLT Platform could be used with participants who are liable when posting information by means of keys enabling them to post information on the ledger. A CSD

[41] This would not remove the possible liability issues the issuer may face in providing accurate information on corporate actions using its official communication channels, but these aspects are outside the scope of the DLT solution.

or a Utility manages the tokens to access and publish the data on the DLT by the issuer agencies.

4.3.2 Artificial Intelligence

On the area of artificial intelligence tools, information extraction and machine learning technology, in particular, can be used to deploy high-precision analytical solutions which analyse unstructured corporate action data/text and convert them to data that would be as trusted as the parties vetting it. For example, Natural Language Processing (NLP), which is an application of AI, could screen the legal text of a corporate event, extract operationally necessary information and transform it into a structured format to be used as a Trusted Copy for operational procedures. NLP will develop to be able to interpret texts with continuous analysis of such events and rapidly improve in quality.

The question of liability arises as the technology can be used in different ways. It can be used as a help to the issuer to convert 'unstructured' CA information into a standardised Golden Copy, in which case the liability would stay with the issuer. Alternatively, the technology can be used to enrich the issuer's data to create a Trusted Copy, in which case the user of the information or the developer of the technology the of the bears more responsibility for the information that is made available. However, allocation of such responsibilities should be defined as part of the governance arrangements for the specific implementation and not covered within the scope of this report.

4.3.3 High-level description of the use case

The starting point the DLT-TF identified as the end objective of this use case is a situation where every issuer (or its agent) is responsible for announcing its corporate events by means of standardised, electronically readable, consistently formatted messages and assumes responsibility for their accuracy and correctness (i.e. "Golden Copy" or "Golden Record").

That ideal situation would solve a number of current industry problems, and has been advocated by different industry associations in a recent letter to the European Commission in the context of the Draft Implementing Regulation to the SRD2. In practice, the benefits would be a reduction in the time, costs and risks of intermediaries transposing information.

The main obstacle to achieving such an ideal situation is the lack of a regulatory-mandated requirement for issuers or their agents to produce such information in a standardised, electronically readable message. Also related to that is the responsibility of issuers and their agents to ensure that such information is complete and correct, and how to pass this information on to the first intermediary in the custody chain.

The Fintech-TF focused the scope of this use case on the alternative and more realistic solution of a Trusted Copy, although it would not generate the same benefits as a Golden Copy or Golden Record.

The possible uses of such information are diverse and depend on the combination of level of trust in the information provided by multiple actors (in addition to the issuer or its agent) and the preferences of the user of the data.

4.3.4 Concept of a Trusted Copy in DLT context

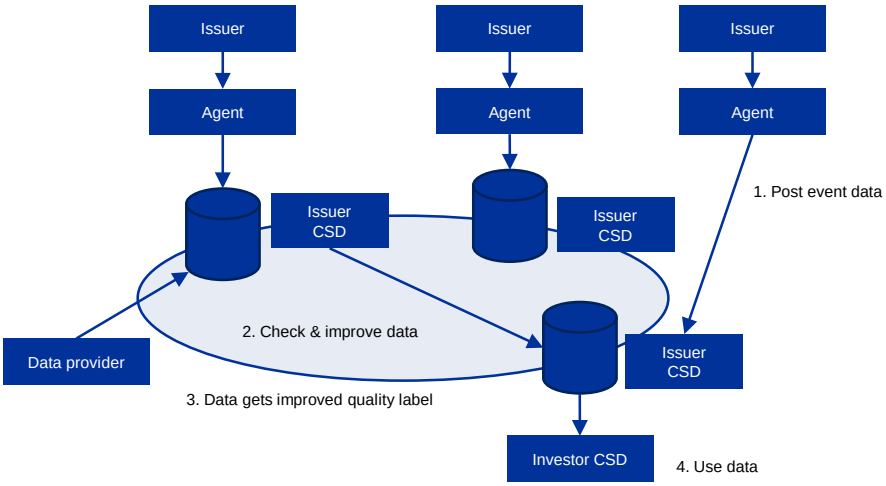
The concept of Trusted Copy refers to a set of corporate action information that has been validated by members operating nodes in a restricted DLT network. Updates on the Trusted Copy are made using a validation mechanism chosen by the governance of the scheme.

Entities providing information take a reputational risk on the information they provide or could be motivated by economic incentives (e.g. in terms of access rights to additional information). Users of the information may set different requirements for the data they decide to assume as trusted, also depending on their intended use, such as which participants of the network have validated the information available in the Trusted Copy.

The use of Trusted Copies is being considered in the Swiss market, partly relying on DLT already. Corporate action data on this platform is validated in collaboration by market participants, which are all users of one restricted DLT network (see Figure 3). The validated information is then used by other participants, which assume liability for its use.

Figure 3

Example of a setup of a Trusted Copy using a DLT network



In Figure 3 the following steps are described:

1. An Issuer or its agent publishes the data. The data is then synchronised over the DLT network;

2. Any party can improve the quality of the data e.g. by adding information on the corporate actions. It is possible to have the added data confirmed by another (or multiple) other parties;

3. The quality of the data is improved;

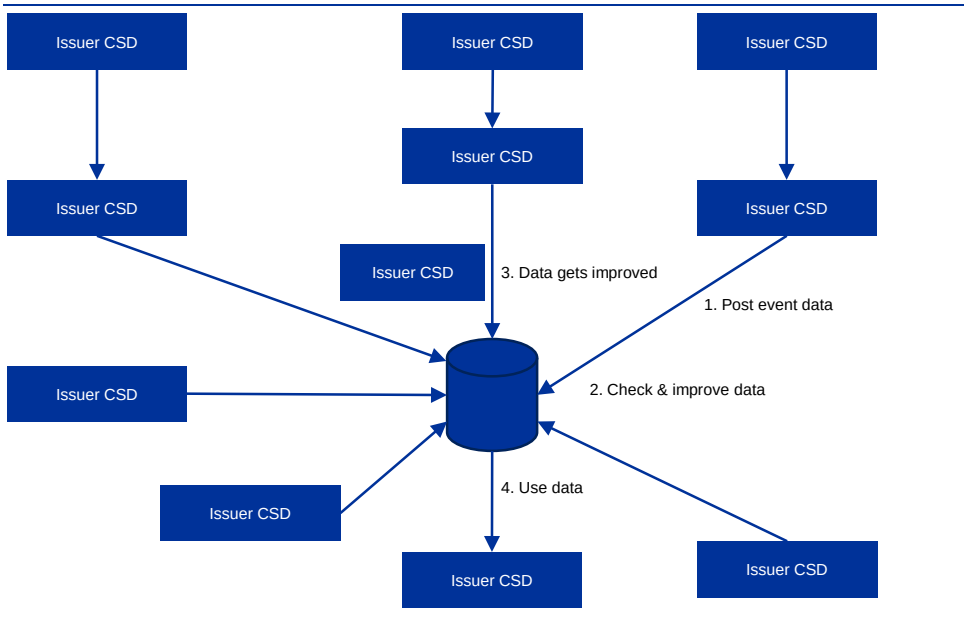
4. Improved data can be used.

Users of the information may use the information for different purposes and require different levels of trust for different purposes.

One **example** that has received further scrutiny is the Swiss market, where DLT technology is being used, but the current solution does not rely on it entirely. Corporate action data on this platform is validated with the collaboration of market participants, which are all users of one closed DLT network. The validated information is then used by other participants in the DLT network. This solution (see Figure 4) serves as an example of a Trusted Copy, where liability is assumed by the user of the information. A possible step beyond the concept of the Trusted Copy has been proposed, where market participants validate the data, add information as a Trusted Copy, and let the issuer (or issuer's agent) validate it as a Golden Copy, including taking responsibility for the information it has validated.[42]

Figure 4

Example of a setup of a Trusted Copy with a centralised database



[42] Because of the improvement of the quality of the data, it needs to be investigated whether the issuer agent is enhancing the information for the right value for money.

In Figure 4 the following steps are described:

1. An Issuer/agent published the data in a central database for which templates and guidelines are defined.
2. Any party can improve the quality of the data e.g. by adding information on the corporate actions. It is possible to have the added data confirmed by another (or multiple) other parties.
3. The quality of the data is improved.
4. Improved data can be used.

4.3.5 Remaining issues and constraints

Standardisation

Market standards are the critical connecting point between market needs and new technologies. Without market standards, and without compliance with the standards, it will be difficult to reap the full potential of the innovative technologies and to build solutions using them and achieve significant efficiency gains. The DLT-TF identified a need for major standardisation efforts in the field of CAs. Firstly, even where standards exist, compliance with them is inadequate. Secondly, in the field of corporate actions the need for new standards arises frequently when new types of CA events are created and the existing standards do not cover these new types of events, or the standards are not fully adhered to.

Further points made by the Fintech-TF:

- Standardisation may be limited by actors on the market that are linked to issuers while not being part of the post trade/post prospectus event processing.
- There is the element of creativity of issues/events. Not all elements of new events may be covered by the limited fields and standards (see above). Hence whether all events are covered by the scope of the agreed standards.
- Current (CAJWG) standards should be used to the extent that they are sufficient, or development of new standards should be delegated to the group which has proven most successful in the past.

Liability and access rights

The allocation of liabilities related to the accuracy and correctness of information relevant for the processing of corporate actions is a key challenge for this use case Indeed, mistakes or inaccurate information could cause erroneous processing of

corporate events and as consequence produce losses both for issuers and/or for end-investors.

The main difference between a Golden Copy and a Trusted Copy has been discussed above. When the information is provided, modified or scrubbed by other intermediaries, the issuer cannot be held liable for it and at that point the source becomes a Trusted Copy. Today the operational risk embedded in the transmission of information related to corporate events is driven by: (i) a lack of standardisation of information for processing the corporate action; (ii) a continuous need to ensure interoperability between different proprietary systems. Hence having a common shared database whereby all entities involved in the processing of corporate actions have access through appropriate validation mechanisms to a single set of reliable information could reduce operational risk and therefore reduce liability.

The new platform technology would ideally take liability, or push for liability towards the issuer agencies (see standardisation). Therefore, from a legal point of view it will be important to clarify who will be accountable for the information provided.

Consensus model – who, if anyone, bears the liability in a system built on a consensus model? Is a Golden Copy with liability possible using a consensus model/ledger?

Table 4

CA information use case -liability issues in selected innovative technologies

	DLT	AI	Centralised
Issuer liability upfront	Smart contract templates 'force' the issuer to comply with standards	Information extraction technology or AI is used by the issuer to ease the 'translation' to standards	A centralised portal 'forces' the issuer to comply to standards
Liability to the network	Initial information is enriched by the network and users of that information take the liability	Information extraction technology or AI is used by a user to interpret the CA information	The network gets access to the centralised portal to enrich the information.
Issuer liability by validation	Initial information is enriched by the network and the issuer has a validation role. After validation the trusted record becomes a Golden Copy	/	The network gets access to the centralised portal to enrich the information and the issuer validates this enrichment with a Golden Copy as a result.

Accessibility

Access rights can cover e.g. the right to update the data available on the source, or to access the source to retrieve or view the corporate action information available on the source without any right to update the information. Furthermore, the rights to update or to view the information available on the source can be granted to one or more parties, which would serve as gatekeepers in terms of who can access the ledger and what rights different participants are granted.

Depending on the technical solution, not all parties will have direct access to the copy. In the DLT setup, parties not directly connected to the network need access via intermediaries in order to benefit from the full potential of the DLT. Depending on the technology used and the role of the participant, liability is different.

4.4 Conclusions and way forward

A main challenge in the area of corporate action information is that data is not always standardised and different parties with responsibilities for providing shareholders with the relevant data are duplicating efforts to scrub data to identify the key information in an event.

Lack of standardisation has resulted in creative regional initiatives focusing primarily on creating a Golden Copy (where the issuer or its agent provides the data), or a Trusted Copy (as in the Swiss example).

The Fintech-TF recommends that the key elements of an event should be provided by the parties closest to the information, i.e. issuers and their agents, to allow the CSD and Intermediaries to pass on the data in the best possible timeframe.

Within the EU we recommend proceeding and focusing on:

- using standards, e.g. ISO / SWIFT, to also benefit from greater harmonisation;
- having issuers/issuer agents to use platforms to push the key data in standardised, machine readable format which will also benefit shareholder transparency.

As a result of further standardisation, within the EU we could see innovative technologies play a role in:

- facilitating the requirements to pass on certain information in different languages (e.g. using Natural Language Processing (NLP) and translation algorithms);
- allowing the use of different communication formats with a pull approach, using messaging functions based on a DLT/Blockchain network, versus the current push approach, mainly based on SWIFT formats (a DLT solution not necessarily to replace current flows, but also to be used in conjunction with them).
- whilst focus is on standardisation, there is still a need for data scrubbing where the information is not standardised (e.g. use of free format fields). Here, new technologies focused on information extraction and machine learning (ML) can play a role (as described in 4.3.2).

Further focus is recommended on the following aspects of CA information:

1. identifying technologies other than DLT that could be relevant for CA Event processes;
2. high-level assessment of the potential impact of those technologies on relevant CA Event processes;
3. identifying possible applications of those technologies for the purposes of harmonisation.

5 Electronic voting

5.1 Overview of current processes in the field of voting

Shareholders have different options for casting their votes and exercising their rights based on their proof of entitlement. The shareholders can send their voting instructions (electronically or by fax or via mail) directly to the issuer or the agent of the issuer handling the general meeting. Proxy voting refers to the procedure allowing a shareholder to cast a ballot without being physically present at a meeting, either via methods allowing direct voting (e.g. by mail) or via an agent. As an alternative, electronic voting (also called e-proxy voting) is used increasingly not only by shareholders located far from the issuer domicile but also by shareholders located in the country of the issuer. The electronic voting process is not always possible currently and if available, it is not standardised in Europe.

5.1.1 Electronic voting

For shareholders to be involved in the decision-making of a company, the latter needs to contact them and provide the necessary information to i) make them aware that a ballot will take place; ii) inform them about the issue(s) under discussion; and iii) enable them to cast their vote. This process involves the same players and a similar workflow to that of the shareholder transparency process (see Chapter 3).

The steps in the electronic voting process are very similar to an elective corporate event:

1. meeting announcement;
2. shareholder entitlement determination on record date;
3. collection of electronic voting instructions;
4. confirmation of meeting participation and meeting results.

ISO20022 messaging that would allow straight through announcement of the meeting and agenda resolutions from Issuer to Investor and back for the vote casting exists, but these messages are not widely used. In reality, at best ISO15022 messages that do not allow full straight through processing (as they were not designed for general meetings but rather for corporate actions) are used between intermediaries. Three different processes are generally followed:

Issuers announce the general meeting in the official journal, the Stock Exchange and local press and publish the Meeting Convocation on their website from where the intermediaries need to collect the agenda and resolutions. Many banks have outsourced voting services to voting service providers that have developed proprietary

solutions introducing some operational efficiency for a process that is still very paper based and non-standardised.

In some markets, a domestic voting platform is used outside the chain of intermediaries to publish the meeting announcement to the shareholders and collect their voting instructions. In such cases, voting entitlement is established in different ways depending on the market: leveraging a (temporary) shareholder register, determined by law at the last intermediary, or reconciling securities holdings through the chain of intermediaries.

In other markets, the Issuer CSD will receive the meeting announcement from the Issuer agent, Stock Exchange, proxy provider appointed by the Issuer or data vendor by e-mail, file transfer or ISO15022 corporate action messages and/or manually collect meeting information from the Official Journal, local press and Issuer website. The Issuer CSD manually creates the meeting announcement and sends it in ISO15022 corporate action message type to its participants or to the proxy provider they have appointed. The CSD participants (or their proxy provider) will distribute the meeting announcement further down the chain of intermediaries. In order to collect the vote from the shareholder and pass it back up through the chain of intermediaries typically an ISO15022 corporate action election instruction or GUI screen interface is used. Voting confirmation is rarely part of the service offered today.

5.1.2 Difficulties of an operational nature in the area of electronic voting

To channel company information required by voters and to provide them with the confirmation that a vote has been recorded and counted, it is necessary for the company to have clarity on the intermediaries which are involved in a holding chain. This is necessary to enable shareholders to fully exercise their rights. These requirements can be met successfully with the type of solution envisaged for an IDD in Chapter 3 on shareholder transparency.

Many arrangements currently used for voting are inefficient, expensive and based on outdated technologies. Long holding chains with many intermediaries, some of which may be in different countries and use different systems, increase the inefficiencies. Furthermore, in current systems, votes and other information are not always transmitted between all shareholders and issuers without errors. Where ISO messages are used, they are the ISO15022 messages designed for elective corporate actions and not for general meetings for which a specific ISO20022 message set has been created. As a result, a lot of information related to the meeting agenda and resolutions are included in narrative text making the electronic voting process nearly impossible (unless structured text is used in the narrative).

Different voting practices exist across markets (and even within a single market) to determine voting entitlement and in order for a shareholder to cast its vote. To take the example of France, some issuers announce and receive votes via a market platform while, in parallel, issuers that have not subscribed and custodians not connected to this platform use a process still based on the printing and signing of proxy cards. This makes the voting process very burdensome and prone to mistakes, especially from a

cross-border perspective. This has also resulted in a number of intermediaries not offering voting as a standard service to all their clients.

Similar to the aforementioned case of shareholder transparency, the fact that information is spread across the IT systems of different market participants causes some issues:

1. On record date, two intermediaries may temporarily have some shares duplicated in their respective systems. When that happens, e.g. in the case of re-hypothecation, the number of shares reflected on the account of the client does not correspond to the actual number of votes belonging to the shareholder. Too many votes can then be notified by the broker to the tabulator leading to over-voting. In this case, depositories notify intermediaries of the over-voting issue and the intermediaries resubmit the vote. However, some cases may occur when the client casts more votes than they are actually entitled to do but this does not result in over-voting as the third party has not voted. In this case an acceptable number of votes will be recorded and the issue may be unnoticed.

2. When multiple intermediaries are involved in a holding/voting chain, it is difficult to verify that the choice expressed by a shareholder is reflected in the vote cast, due to a lack of transparency in passing the votes through the chain.

5.2 Fintech-TF suggestions to address open issues via use of technological innovation

The Fintech-TF considers that a solution like the IDD service lends itself naturally to use in the area of electronic voting. Utilising the IDD for electronic voting purposes would mean that technologies used for the use case on shareholder transparency could also be applicable for the purposes of electronic voting.

5.2.1 Identified relevant technologies

DLT allows information sharing consistently without the need for a central party to hold all information. Like the use case on shareholder transparency it is necessary to involve all intermediaries along a holding chain and the validation process should ensure that data remain immutable and verified through the chain.

In the case of IDD, counterparties can update the subset of information that would reflect the voting choices attached to the shares they hold as last intermediaries and which would be passed on to the issuer directly, using the IDD.

5.2.2 High-level description of the use case

As the last intermediaries in the holding chain receive tokens in the IDD chain representing the shares held by end beneficiaries, an equivalent number of voting tokens could be created and allocated to them for events such as an AGM.

5.2.3 Remaining issues and constraints

A major point of concern, already mentioned above, is the possibility that intermediaries could opt for different ways of taking part in the information flow, and the electronic voting based on an IDD solution would not be sufficiently used. Like any other network utility service, an IDD-based electronic voting solution would only be effective if a sufficiently high number of institutions use it and form a critical mass able to attract other institutions that may not be directly involved in designing it.

An issue to be addressed is related to the IDD's governance (a topic to be expanded with regard to this and other use cases). It should provide standards to ensure resilience of the service and simplify synchronisation between the IDD network and the standard settlement accounts, as well as to define the type of smart contracts to be used.

Lastly, a fourth issue is that these types of services are being provided by commercial entities/vendors, whose business model is built around it. A utility service could have a substantial impact on their business model and revenue streams.

5.3 Conclusions and way forward

Similar to the case for shareholder transparency, it can be expected that along with the SRD2 there will be need for market initiatives to either provide a utility service or standardise and harmonise different solutions to deal with the electronic voting process.

Similar to the use case on transparency of holdings, the use case on electronic voting is more likely to gain relevance and be successful in a scenario where key market players combine forces to develop a shared market utility or, at a minimum, to agree on smart contract and data standards to ensure interoperability between different solutions. Without broad adoption of the service throughout the holding chain, its benefits would remain rather limited. While DLT has some obvious benefits which could facilitate the functioning of such a utility, there are other existing-technologies which could also provide the right functionality, provided that broad usage of the data standards and interoperability are ensured.

6 Withholding tax procedures

6.1 Introduction

The area of withholding tax (WHT) procedures was identified as one of the areas where it would be worthwhile to explore possible use cases reflecting the possibilities for using various new technologies. The use case addresses inefficiencies in the current WHT procedures in Europe and explores the areas where innovative technologies could provide answers to these inefficiencies, many of which have also been identified in the CoC. Technologies identified as relevant for this use case include Digital identities in line with the eIDAS regulation, an EU wide repository of Certificates of Residence, which would be using DLT technology, and Smart Contracts. The combination of these could pave the way to further automation in the WHT collection process using smart contracts. In the field of WHT procedures in particular, lack of standards is considered to hinder development of pan-European procedures and practices. The need for harmonisation of withholding tax procedures was foreseen as part of the list of T2S harmonisation activities[43]. The AMI-SeCo report on the potential impact of DLT in securities markets identified possibilities for adopting DLT-based solutions in this field, with the caveat that for them to become effective it would be imperative to ensure all the relevant necessary actors adhered to these solutions. Possible DLT solutions include automatic collection of taxes simultaneously with the payment of the income. Such automated processing would imply that reclaim and refund procedures would no longer be necessary, since all eligible tax rebates as per the provisions of the relevant double tax treaties would be processed “at source”. The need for tax agents and tax procedures would remain for non-connected parties.

To trigger work in this field the main aim is to identify areas and items that would deserve further analysis and where innovative technologies could provide answers to address current inefficiencies. Section 6.2 of this chapter is instrumental to this, as it provides background information on the complexity of the matter and of the current processes, the major players and interested stakeholders, and the appropriate next steps as well as in what order they should be taken. Section 6.4 describes possible new technologies that may be useful to consider in relation to these processes.

6.2 Overview of current processes in the field of WHT procedures

In order to understand the complexity of the matter and to identify where a change in the current processes would be warranted, it is necessary to identify and understand how the current processes are wrought and that the processes vary between countries. One significant impact of different processes on the investor is reflected by the duration of the tax reclaim process in different European countries. Differences in the duration of tax reclaim processes can be significant. In some cases the difficulties

[43] See Annex 1 of the Ninth T2S Harmonisation Progress Report.

in reclaiming taxes have reached the level that it is not always certain whether taxes can be reclaimed at all.

Currently, the processes for reclaiming refunds are largely paper-based due to the specific law requirements of each country. For example, in the Standard Tax Reclaim process for Public Debt securities in Spain, although there are electronic forms that could be generated automatically, official certificates that must be expressly issued by a public entity (General Secretariat of the Treasury and Financial Policy) are required at the time of the request.

Furthermore, as stated before, these electronic forms are different depending on each country, due to the lack of harmonisation of tax collection and relief procedures. Many of these issues are among those addressed in the CoC as described in Section 2.2.

In most EU countries, it is possible to provide all the relevant documentation upfront (i.e. before the taxable income is distributed) to local Tax Authorities (in particular, the so-called “Certificate of Residence”, or CoR). At the time of income distribution, the correct tax rate can therefore be applied (under the so-called “relief at-source” procedure).

In some cases, the withholding tax is deducted from the income payment and the exemptions are not automatic. The investor that wishes to obtain tax relief or exemption as envisaged in the applicable DTAs can therefore only submit a refund claim, supported by a set of documents to evidence the amounts of excess taxation suffered and its eligibility for a refund in accordance with the DTA provisions. However, there are few countries in Europe where the tax reclaim process takes significantly longer than 6 months, while the majority of Member States can process claims within 6 months. The evidence from recent years supports the claim that the procedures have been improving, and procedural enhancements have translated into shorter repayment timeframes.

6.3 Fintech-TF suggestions to address open issues via use of technological innovation

Several innovative technologies have been identified as possibly relevant for WHT processes broadly and of help in addressing inefficiencies in the current processes. This section provides a high-level overview of which inefficiencies each of the selected technologies could possibly help to address.

6.3.1 Digital identity

Tax identification of investors is the basis for the definition of the correct withholding tax rate to be applied to each investor. Various methods are currently in use, including social security numbers, taxpayer identification numbers (TINs), etc.

The use of modern digital identity tools would bring significant benefits: In addition to traditional forms of identification (such as SSNs, TINs, LEIs, etc.), the adoption of e-identity solutions could be usefully explored, along the lines indicated in the eIDAS regulation (electronic Identification, Authentication and trust Services)[44].

6.3.2 EU Certificates of Residence Repository

All current Double Tax Agreements require the Tax Authorities to exchange Certificates of Residence (CoRs) to prove the country of residence of each investor (natural or legal persons) for tax purposes. At present, there are numerous different approaches to how CoRs are produced, including paper forms and pdf documents, digital ink and traditional "wet" ink, digital authentication as well as stamps and signatures, etc.

6.3.2.1 DLT-based repository

In line with the CoC principles, the adoption of a shared electronic ledger for the creation, storage and exchange of digitally authenticated CoR certificates would be a possible way to modernise, digitise and streamline the entire process. Further analysis would obviously be required to actually confirm the possible benefits of a DLT-based solution for this purpose, compared to a traditional centralised repository using traditional databases, but from the governance perspective a solution based on DLT could offer possibilities for the Tax Authorities in each respective jurisdiction to maintain the necessary control over approving and rejecting participants and the data inserted before it is shared in the ledger that could be accessed by tax authorities in other countries.

Various potential benefits of DLT adoption have been identified, including the streamlining of process flow throughout the holding chain, increased transparency, a higher level of harmonisation and reduced operational and credit risks. As possible weaknesses of using a DLT-based solution, potential problems were identified in relation to interoperability issues, negative impact on current providers of WHT services (via a disruptive impact on services they offer) and the need to develop new interfaces and procedures across a rather wide and diversified range of actors.

6.3.2.2 Multiple databases with the possibility of using APIs

An alternative approach would be to create an EU-wide repository for CoRs by building on (national) databases which would be connected via APIs. This would allow the national authorities to have control over CoRs in their respective jurisdictions and at the same time allow different databases to exchange information via APIs.

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[44] eIDAS is an electronic identification Directive that was established in EU regulation № 910/2014 of 23 July 2014 on electronic identification and repeals directive 1999/93/EC with effect from 30 June 2016. It entered into force on 17 September 2014 and applies from 1 July 2016.

6.3.3 Smart contracts

The combination of digital identification of investors and the single repository for all CoRs (i.e. all tax- relevant information related to investors) could pave the way to further automation in the WHT collection process using smart contracts. Potential benefits could be obtained in developing suitable algorithms to determine the correct amount of taxes to be withheld for each income stream and individually for each investor receiving those incomes, at the moment when the income is actually disbursed.

As already mentioned before, the practical realisation of this concept would hinge on the ability to attract a very wide range of actors into this model, including the issuers of securities producing taxable incomes, the investors that hold those securities, receive the income and are required to pay the correct amount of taxes, the intermediaries (banks, custodians, depositories, etc.) acting as conduits of the data on relevant holdings and on eligible investors, as well as the tax authorities that collect the taxes and need to adequately control the correct execution of the entire tax process.

6.3.4 High-level description of the use case

FMIs and intermediaries envisage that their users and clients could register their important tax data once, in a secure and trusted environment. One identified key benefit of being able to register the data in a decentralised manner would be the higher level of control it would give to individuals and national authorities. Once the data are registered, investors could agree to give permission for intermediaries and tax authorities to access it. This would benefit investors by having a single registration for multiple intermediaries and multiple EU markets, greatly reducing the paperwork burden on them. It would also benefit intermediaries through digitisation of the records, which could increase STP rates. There is also a potential link here to the topic of transparency of holdings (see Chapter 3), in that the resulting records of holdings may also be used for shareholder registration.

6.3.5 Remaining issues and constraints

Tax laws, DTAs and the fiscal treatment of market claims are part of national legislation and will not be harmonised in the foreseeable future. There are other areas where further harmonisation could be achieved, in particular in the field of tax collection and relief.

While the enhancements proposed in this chapter would contribute to more automated WHT procedures, much remains to be done in the field of standardisation of tax reclaim forms and moving away from paper-based processes. Current paper-based processes, in particular for reclaiming refunds, leave plenty of room for further digitisation.

While the objectives set in the CoC are laudable and go in the right direction, their impact depends on the scale of their implementation and on how many and which countries take steps in the direction of implementing those measures. The European Commission services and Member States' tax experts are following up on the CoC implementation.

Not only do tax withholding procedures currently differ amongst countries but APIs used by tax authorities are also heterogeneous. This also leads to issues concerning API compatibility, especially in the case of cross-border processing. Standardisation of APIs would promote harmonisation and also allow streamlining of withholding tax procedures involving Double Taxation. Defining a common set of technical, operational and business requirements in order to ensure the interoperability of APIs throughout Europe would facilitate the adoption of an approach where APIs would be used between countries. An example of an initiative going in this direction in the payments sphere is the working group on Payment Initiation Services (PIS), set up by the Euro Retail Payments Board (ERPB).

6.4 Conclusions and way forward

AMI-SeCo considers that the harmonisation of tax procedures is a high priority and urgent activity in the context of the CMU initiative, the T2S harmonisation agenda and the integration of EU financial markets. The work initiated by the EC with the CoC should be followed by more detailed work, both on the harmonised implementation of the proposed principles and guidelines by all EU Member States. A combination of modern, innovative technologies contains the potential to address issues that the industry and national tax authorities face in this area. The AMI-SeCo, its members and substructures stand ready to provide additional practical support to the Commission and the EU tax authorities for the definition of the next steps in the practical implementation of the code.

7 Overall conclusion and the way forward

The Fintech-TF was mandated to look into the possibilities innovative technologies offer to address issues in the post-trade environment. In order to do this, the Fintech-TF focused on post-trade processes: (i) which are less technology supported (i.e. shareholder identification and WHT procedures), (ii) where the technical solutions implemented are fragmented, (iii) which are challenged by upcoming regulatory requirements (e.g. transmission of information related to corporate actions processing).

A shared feature of the use cases presented is that they consider the use of new technologies to draw-up harmonised solutions to currently fragmented processes for sharing pieces of information among actors of the “post-trade network”. In this context, from a technical point of view the use of innovative technologies, DLT in particular, does not exclude the possibility that the same objectives could be achieved using technologies on which the majority of institutions in the industry currently rely.

Nevertheless, it should be recognised that for the post-trade processes analysed in each use case, which require the sharing of a set of standardised information among different entities that are part of the securities chain, DLT seems particularly “fit for purpose” as it supports the set-up of a “single database” where information can be accessed and exchanged by relevant actors, reducing administrative effort and manual intervention. DLT also achieved impressive improvements in recent industry experiments, which makes this technology attractive for supporting those use cases in the future.

Further harmonisation and standardisation challenges posed by the implementation of regulatory requirements suggest the opportunity of an industry-wide approach to the elaboration of a common operational model and interoperability between different solutions. Interoperability of solutions based on DLT is crucial to avoid fragmentation. Solutions used for passing on and sharing standardised information are typically not standalone systems. To drive and facilitate adoption of DLT-based solutions by institutions within the industry, interoperability of DLT-based solutions between other solutions based on DLT, as well as with legacy systems, is an area where further work is needed, e.g. in defining standards. It is acknowledged that work on this area has also been identified on several other fora and duplication of effort needs to be avoided.

In terms of the way forward, the analysis of the use case suggests that the actual implementation of DLT solutions warrant a re-evaluation of the governance of current processes and, in particular, of whether the creation of a “shared database” implies a shared governance of the network and to what extent the most common DLT network governance models as described in this report (i.e. consortia, joint ventures that enter the market or are set up for the purpose of offering services) fit into the regulatory environment.

From a broader perspective, the analysis of the use cases also suggests that unlocking the potential of new technologies would benefit from the dismantling of

outstanding harmonisation needs and barriers identified within other fora such as the EPTF and the Expert Group on Regulatory Obstacles to Financial Innovation (ROFIEG).

Annex 1: Sketch of starting point for discussion of a Fintech-TF proposal on Investor Data Directory (IDD)

Investor Data Directory (IDD) would be a service for the efficient and confidential sharing of investors' data (e.g. to update shareholders' registers). Ledger would be updated either upon a business event, such as confirmation of settlement in the custody chain, at a request by an issuer, or at agreed time intervals to provide information on shareholders' and/or on the "last intermediary" responsible for providing such information.

The Level 2 regulations of the SRD2 set the minimum requirements to transmit the information and the format of e.g. the request to disclose information regarding shareholder identity and of the response to such request.

Figure 5 presents a possible setup of the Investor Data Directory (IDD). The main legal reference for the IDD platform design is the SRD2. National applicable law for use in registration process should be that of the issuer.

1. The main responsibilities of the Investor Data Directory service operator, denoted in the figure with "IDD", would be to provide governance, standards, business logic (smart contracts) and the mapping between nodes in the IDD network and standard settlement accounts. The IDD service operator would also be responsible for maintaining static data in the IDD. Static data in the IDD could be e.g. contact details of intermediaries from all markets. The issuer could use the data to contact the intermediaries when necessary.

2. IDD service provider, denoted in the figure with "Issuer agent/CSD1", would instantiate smart contract for its ISIN(s) so that intermediaries can exchange tokens upon agreed event or time interval. Actors with this role would also provide IDD service to identify either (i) the contact details of last intermediary or, (ii) shareholder information. They could see info of their clients and on last layer of all holding chains but not necessarily info on intermediaries involved in all other layers.

3. In accordance with the SRD2 art.3a.3 para.1 Intermediaries in the middle of the holding chain (e.g. Investor CSD2, Sub-sub-custodian 1.2 and Sub-custodian 1.2.1) is responsible for providing information as requested by the issuer and for updating the distributed ledger without a delay upon agreed event or time interval.

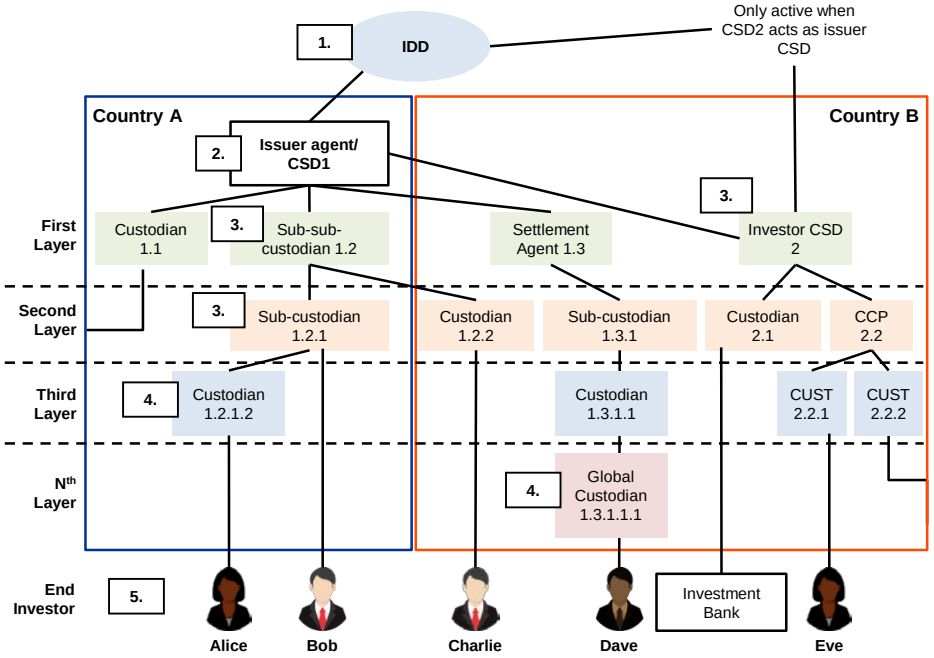
4. Last intermediary in the holding chain (e.g. Custodian 1.2.1.2, Global Custodian 1.3.1.1.1) provides contact details of shareholders and communicates to the issuer or its agent information on shareholders' identities when requested meeting the requirement set in the SRD2 art.3a.2. In line with the SRD2 art.3a.1

the last intermediary does not, however, report holdings lower than threshold set in issuer's national legislation. This threshold would be encoded in ISIN-specific smart contracts. The last intermediary does not store shareholder information on distributed ledger and is responsible for managing such data on internal systems or by updating records in a separate database held by the issuer or its agent. This would be necessary to meet the requirement set in the SRD2 art. 3a. 4-5.

5. The shareholder information on the end investors could in theory be kept in the IDD. This does not seem proportionate, however, as the issuer is likely to store the information elsewhere.

Figure 5

A possible setup of the Investor Data Directory (IDD)



Annex 2: Proposals made by the ST-TF to address issues related to shareholder registration process and transparency

I) CSD disclosure service

The first model is building on the existing link between an Issuer CSD and an Investor CSD, either of which could be the main actor in the process. The issuer or Issuer Agent would make a Shareholder Disclosure Request (SD request) via Issuer CSD, to receive from any of its Investor CSDs the breakdown of account holders in their omnibus accounts (first layer information). Based on this breakdown, a second request would then be sent to obtain information on the breakdown of account holders further down the holding chain (second layer information) either a) by the Issuer CSD to participants of the Investor CSDs or b) by the Investor CSDs to their own participants (as described in Figures 6 and 7 below). The Issuer CSD or, in case (b), the investor CSD, would then need to follow the same procedure to collect the subsequent layers of information all the way down to the end investors.

Figure 6

CSD disclosure service via Issuer CSD

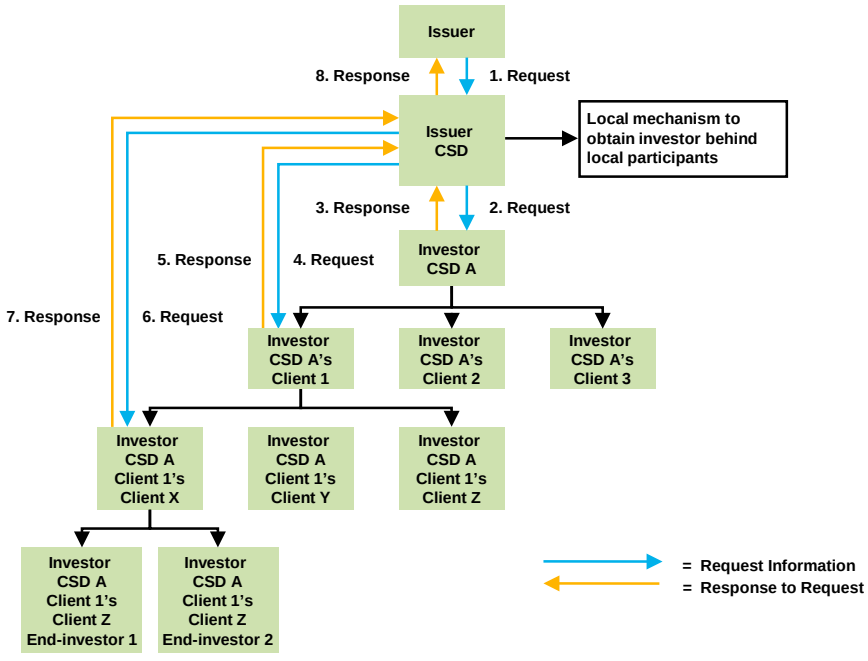
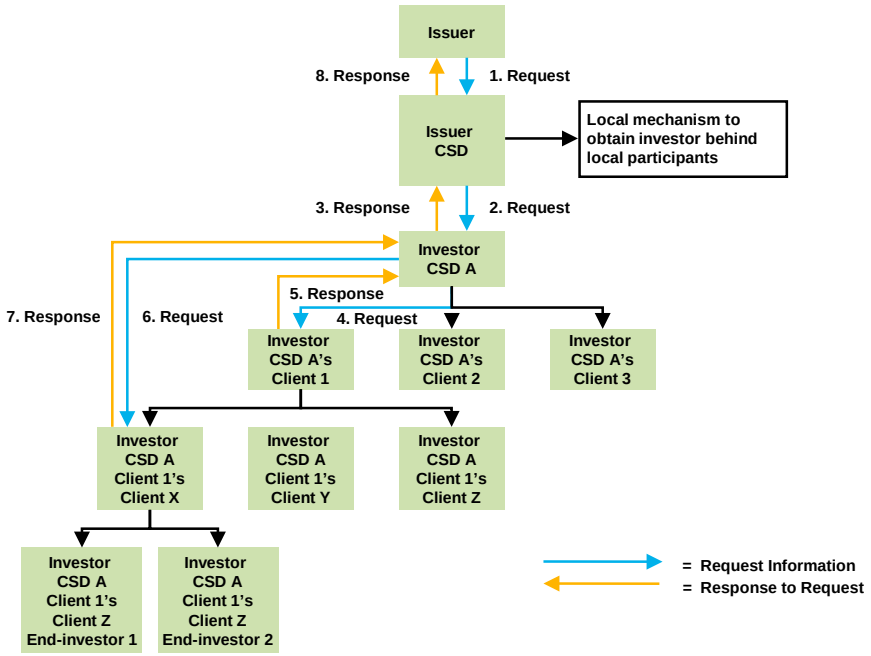


Figure 7

CSD disclosure service via Investor CSD

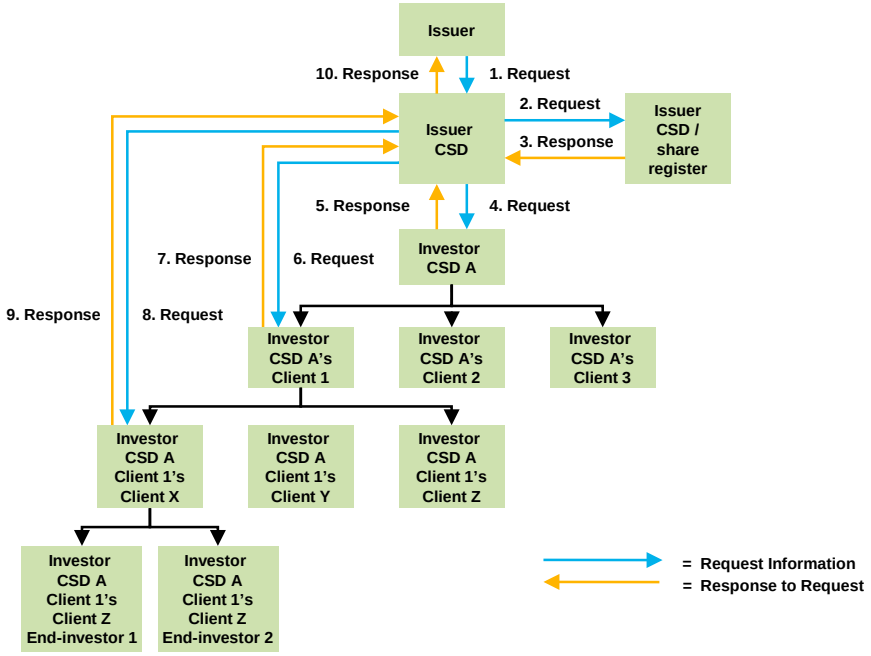


II) Issuer agent disclosure service

In the second model (described in Figure 8 below) the Issuer Agent substitutes the role of the Issuer CSD in making the initial SD request to the Investor CSD, as well as to the Issuer CSD, to obtain first layer information. All the characteristics applying to the first model are practically identical for the second one.

Figure 8

Issuer agent disclosure service

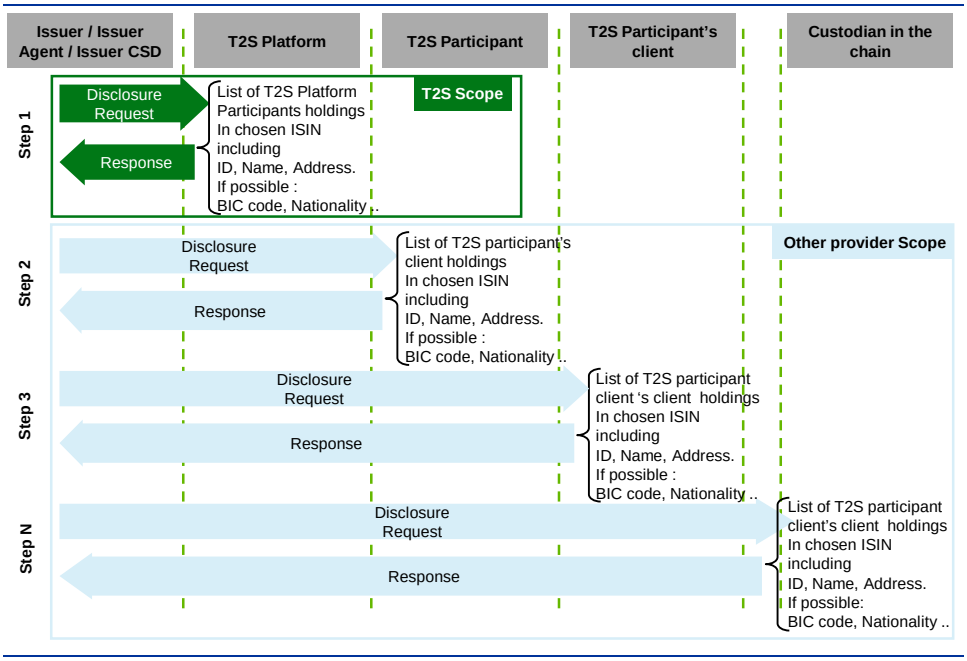


III) T2S data extraction model

In the third model (described in Figure 9 below) the T2S Shareholder Disclosure Requesting Party (SDRP), i.e. Issuer or Issuer Agent/CSD, can obtain all Issuer CSD and Investor CSDs' account level information directly from T2S, which updates information on holding balances at the level of Issuer CSD and at the first layer of the holding chain (i.e. breakdown of holdings of participants of Investor CSDs) in real time. There is therefore no need for the Issuer CSD or Agent to contact the investor CSDs and their participants. To contact and obtain registration information from entities from the second layer of the holding chain all the way down to the end investor, the accounts of which are not available in T2S, the SDRP would still need to use one of the two models previously described.

Figure 9

T2S data extraction model

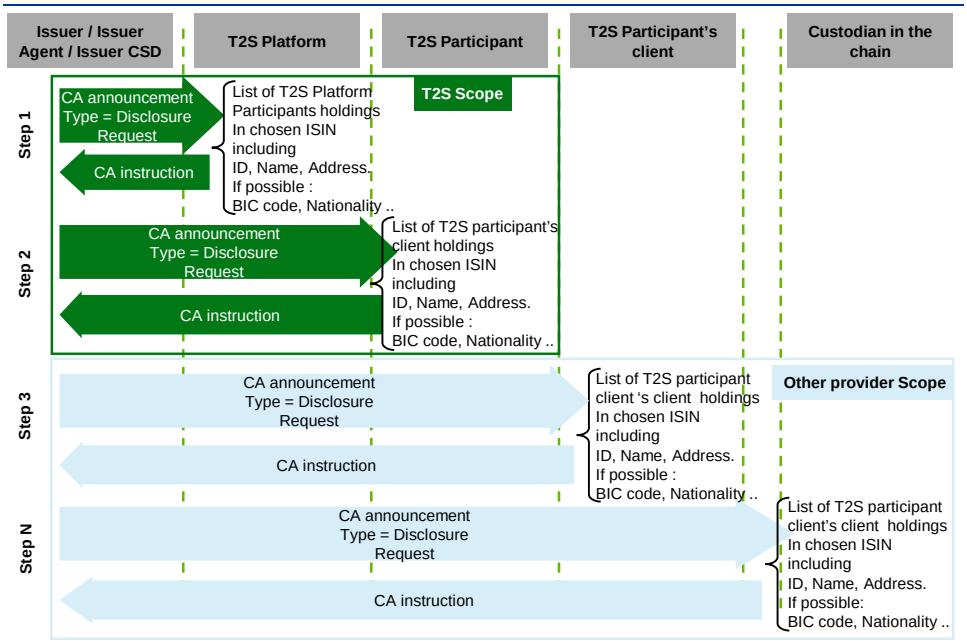


IV) T2S messaging hub

Finally, in the fourth model (see Figure 10) the T2S SDRP can obtain all Issuer CSD and Investor CSDs' account level information directly from the platform. However, T2S messages of the type "Corporate Actions announcement" are used to obtain such information up to the level of clients of T2S participants. To contact and obtain registration information from entities at lower layers of the holding chain, the accounts of which are not available via parties connected to the T2S platform, the SDRP would still need to use one of the two models previously described.

Figure 10

T2S messaging hub model



V Messaging standard

Regardless of the models used for shareholder disclosure, the ST-TF found that market participants needed an ISO disclosure message standard that could apply both to local and to cross-border disclosure requests. At the first layer of information (i.e., CSD account holder) it is expected that the issuers would be able to request all accounts and their balances for a specific ISIN at the end of day, or all accounts that have changed during the day for a specific ISIN at the end of day. At subsequent layers of information, the SDRP sends a request (message 1) to the Investor CSD/Custodian who would then return details of holdings of their respective clients (message 2). After processing the information, the SDRP may choose to request the same breakdown from any of the holders at the subsequent layers and the process continues in the same way until the issuer confirms that it has received all the required information. A proposal was made to ISO by ST-TF members.

Annex 3: List of contributors

Composition of the HSG Task Force on Technological Innovation in Securities Post-Trading (Fintech-TF) that prepared the AMI-SeCo report.

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For specific terminology please refer to the ECB glossary. Hyperlinks in the document were last updated on 9 January 2019.

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